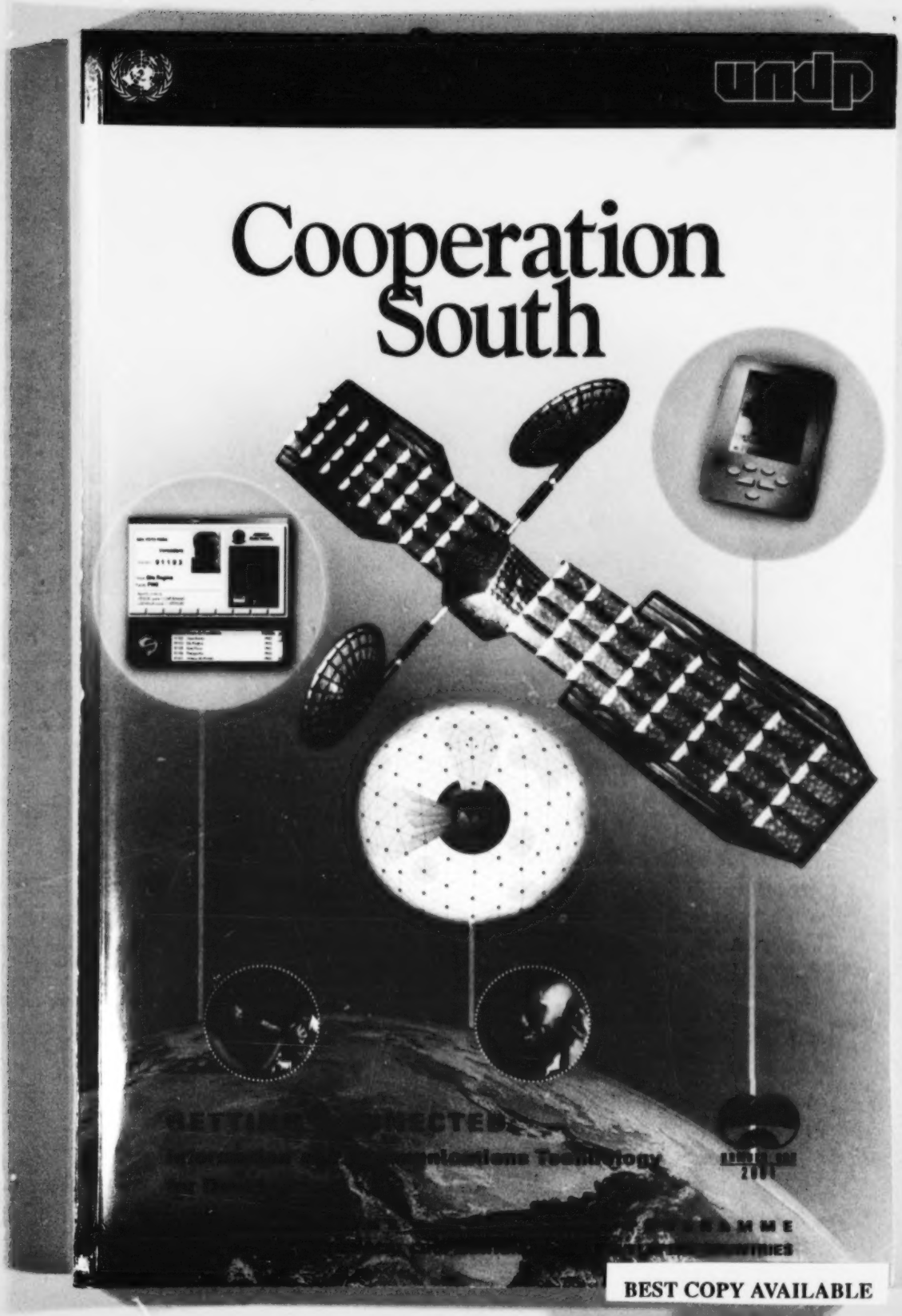
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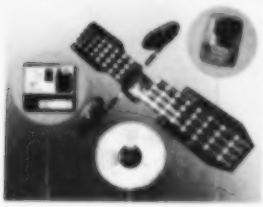
THE CREATIVITY OF 4.7 BILLION PEOPLE

THE COVER DESIGNS USED ON ISSUES OF THIS JOURNAL PRESENT ARTIFACTS OR ARTWORKS THAT DEMONSTRATE THE CREATIVITY AND CONNECTIVITY OF PEOPLE ACROSS THE SOUTH.

Southern scientists harness information technology



Computerized voting machines (top left) were developed in Brazil and used in elections in 1996, 1998 and 2000, involving 110 million voters. Easy to use even by illiterates, they are secure from abuse and rapid in their tallies.

WorldSpace satellite (top center). Direct audio and data transmissions beam to three southern continents from three satellites launched by a company founded by an African. The system can deliver programs to 5 billion people via handheld receivers without needing earth stations.

The Simputer (top right) is a low-cost portable computer with simple interfaces based on sight, touch and audio. Developed in India, it makes information widely accessible, including to illiterates.

Hyperball computer. A Nigerian scientist sees cyberspace as a hyperball computer with billions of processing nodes (middle center). A formula he developed is the basis for super-computers which have since conducted massive studies, such as on global warming.

Cooperation South

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The emblem of Technical Cooperation among Developing Countries (TCDC) displays a symbolic bridge joining the countries and people of the Southern hemisphere.

The centre of the emblem—where the Southern, Northern, Eastern and Western parts of the world join—symbolizes a further and ultimate objective of TCDC: the promotion of a truly global partnership for development.

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FROM THE ADMINISTRATOR

ICT for Development: A New Vision

The potential that Information Communications Technologies offers to developing countries is real; the ability to leapfrog decades, to recapture lost ground, to redeem long-standing promises of prosperity is achievable. Some countries of the South have already moved boldly and imaginatively to do so — to participate in the international economy, to exploit emerging technologies for the betterment of their citizens, to modernize institutions and markets.

These successes are not surprising. Development cooperation and ICTs, especially the Internet, are both about stimulating wider participation, exchanging experience, communicating ideas, transmitting knowledge, sharing new findings and best practices and facilitating the development of communities of practice and new modes of cooperation, allowing diaspora communities to contribute in new ways with the potential to turn "brain drain" into "brain circulation". Development cooperation, at its best, is also about permitting access to a range of options so as to make informed choices and to allow countries to participate in the process of devising solutions adapted to their circumstances.

Computer technologies can be used to process and make available enormous amounts of information and to distribute it rapidly and relatively cheaply through communication networks.

We know that strong flows of information — properly filtered, adapted and applied — can help to generate part of the human energy needed to power development. One of the strongest statements I have seen on this comes from Ethiopia-born Noah Samara, founder of WorldSpace (featured in this journal's "Windows on the South" section):

"Look behind the wealth of nations and you find information; look behind the poverty of nations and you find lack of information. For sustainable development, civil society and intellectual production, information is truly the need for every need."

Indeed, as is clear from the articles in this issue, it is already happening. In health, ICTs are being used in developing countries to facilitate remote consultation, diagnosis and treatment; across sub-Saharan Africa, for example, the Internet is used to monitor daily cases of meningitis and help to coordinate mass vaccination programmes. In education, many organizations and vocational training facilities are employing ICT for distance learning and to train workers and even teachers in an array of functional areas.

Perhaps most important, however, is the enormous potential contribution of ICT to broader South-South cooperation.

As I recently told leaders of the Group of 77 in Iran, the broader application of new technologies for and by the poor is one of UNDP's top priorities for the new millennium. A big part of the reason is the new impetus it can give to sharing experiences and lessons quickly and effectively across the developing world.

The Southern development experience is rich and diverse, and the Southern list of achievements is long and impressive. Linked by commonalities of history, geography and shared development challenges, the countries of the South have important lessons to share on the battles they have fought, the adversities they have faced and the successes they have achieved.

From Brazil's development of low-cost, internet-ready computers, to India's success in boosting scientific and technical education and adapting wireless technologies and handheld devices, countries of the South already have available a vast and growing pool of success stories that other developing countries facing similar constraints and challenges can share and learn from. The key is to help channel these and other lessons, from homegrown technologies to new policy programmes.

To support this, UNDP is focusing on two areas: advocacy to mobilize support

around a dynamic global agenda of South-South cooperation and giving a strong Southern dimension to our advisory services and technical cooperation. And key elements of this is support for the development and implementation of national e-strategies that would enhance the capacities of countries to harness this new potential, and new decentralized, ICT-enabled knowledge networks that can help spread these lessons more easily.

We are already generating results in the form of initiatives such as spreading the lessons of Brazil's successful HIV/AIDS treatment programmes to southern Africa. By fostering and mainstreaming this kind of sharing of experience through strategic use of ICT, UNDP is committed to helping "South-South" cooperation move beyond being a geographical concept or a political slogan and take its rightful place at the heart of global development.

As our *Human Development Report 2001* puts it: "The ultimate significance of the network age is that it can empower people by enabling them to use and contribute to the world's collective knowledge. And the great challenge of the new century is to ensure that the entire human race is so empowered — not just a lucky few." It is a challenge that we at UNDP are determined to do everything we can to help meet.

Mark Malloch Brown, Administrator
United Nations Development Programme

Digitally Empowered Development

by ALLEN L. HAMMOND

A different development model is needed to make credit, communications, information, and energy sources directly available to communities in poor regions. In this model, businesses would provide goods and services tailored to what poor communities require in order to improve their quality of life and productivity. Communities could take charge of their own development, aided by shared communications technologies that open up new ideas, opportunities and horizons, says Allen L. Hammond, Chief Information Officer and Senior Scientist, World Resources Institute.

THE GROWING GAP

Advances in information and communications technology (ICT) have done more than almost anything else to drive the last decade's economic boom and the integration of markets around the planet. Much of the economic benefit from ICT and the rapid rise of the Internet has so far accrued to the developed world, where electronic commerce is already transforming many industries and where e-mail, cellular phones, and instant messaging are becoming ubiquitous. Money spent on the digital infrastructure that supports these burgeoning new services—from Internet servers to fiber-optic networks—has itself become a major engine of economic growth in some countries. The speed with which ICT is advancing, the corporate economic power it embodies, and the wealth it has created are truly astonishing.

In the developing world, Internet connectivity is growing, but the increased

productivity and other benefits of the digital revolution are still mostly prospective. This global gap or digital divide between the developed and developing world is quite real. More than half the world's population has no access to phone networks, and 19 out of 20 people worldwide still lack access to the Internet.

Lack of access to digital networks is but one of the challenges that face the four billion people—more than half of humanity—who live at the bottom of the economic pyramid, on incomes of less than $1,500 a year. Populations continue to grow rapidly in the poorest areas of the world, and a surge of urban migration, bringing with it unprecedented demands for housing, water, sewerage, and jobs, threatens to overwhelm cities. Biological resources such as forests, fisheries, and the fertile soil on which billions of people still directly depend for food and income are being depleted. Extreme poverty persists in many regions. And despite abundant world food supplies, malnutrition is rising in Africa and southern Asia because growing numbers of people can no longer produce enough food for themselves and are too poor to buy what they need.

These problems are beginning to wreak havoc in other areas as well. Potential conflicts over scarce resources, large-scale migration, and urban crime and instability are starting to threaten national security in more than a few countries. New forms of terrorism, AIDS and other devastating diseases, and the changing climate are all having similarly destabilizing effects. Ever-larger disparities between haves and have-nots undermine the kind of social consensus essential for stability and political progress.

If these dangerous trends continue—if development does not accelerate and if the benefits of economic progress and new technology do not reach those at the bottom of the pyramid—then the future looks increasingly troubled. One possible scenario[1] pictures an unstable future, ridden with conflict and environmental problems, in which islands of prosperity are surrounded by oceans of poverty and frustration. In such a world, even prosperous regions will fear for their security, for when all else fails, the poor will learn to export their misery and anger.

But trends are not destiny. I believe that the imaginative use of emerging technologies and the creation of partnerships or cooperative approaches that combine the skills of major corporations with the growing strength of civil society can accelerate development in even the poorest regions, and can reverse many of the most worrisome trends. Although no less an authority than Microsoft Chairman Bill Gates has recently expressed grave doubts about the power of technology to close the global development gap, such pessimism is misplaced. The potential for bold new measures to jumpstart development already exists. All that is missing is the courage to take the necessary steps.

A BOTTOM-UP DEVELOPMENT MODEL

Achieving this better future will require a new development model, one that goes beyond the conventional focus on free-market capitalism, entrepreneurship, and global trade expansion—although such factors will play important roles. Nor will traditional, top-down development directed by governments and financed by foreign aid be adequate, even though enlightened government leadership can make a huge difference, as recent experience with digitally empowered development strategies in Estonia, Costa Rica, and other countries illustrates.[2] What is needed instead is a bottom-up model that makes credit, communications, information, energy sources, and other self-help tools directly available to communities and individuals in poor regions, empowering them to take charge of their own development.

The idea behind this new development model is that basic services should generally be provided by businesses—sometimes directly, sometimes in partnership with governments or networks of nongovernmental organizations (NGOs). The right strategies can enable the poor to become customers and pay for the services they receive, services that will improve their quality of life and increase their productivity. Such programs could reach tens of thousands or even hundreds of thousands of communities or rural villages—far surpassing the very limited scope of conventional development efforts, and functioning on a scale large enough to make a profound difference in the destiny of a region and the welfare of its people. Very few, if any, governments of developing countries can deliver services in a million places at once, yet many global corporations do just that every day. Why not encourage or incentivize such companies to provide both consumer goods and basic services tailored to the needs and budgets of poor communities?

We need a bottom-up model that makes credit, communications, information, energy sources, and other self-help tools directly available to communities and individuals in poor regions.

Such ideas are becoming plausible, thanks to the rapid global expansion of digital networks, the spread of the Internet, and the proliferation of cyber-cafés, village phones, and other forms of shared access to communications technology. High-capacity fiber-optic links now span the oceans, crisscross China and Latin America, and extend to many African countries. Inexpensive wireless technologies, which can carry data far more efficiently than cellular phones, and new satellite networks are beginning to show how to provide Internet access even in remote rural areas. Voice recognition software that can potentially provide

access even to illiterate people is entering commercial use. In little more than a decade, the vast majority of the Earth's people are likely to live in communities that are connected, in one way or another, to the global digital network.

Communications technologies could accelerate development in far more than just the economic sphere. Indeed, wiring the planet will transform it beyond recognition. It will increase access to educational materials, basic health information, and other critical resources in local languages. A single database in Spanish, Chinese, or Hindi, accessed by phone or cyber-kiosk, could serve much of a continent. Connecting the world could unlock the productivity of poor communities: farmers, for example, could access weather forecasts or planting advice or market prices, which would empower them to produce larger crops for more money. Access to digital networks could improve quality of life more generally, by allowing

Wiring the planet will transform it beyond recognition.

people to summon help, share experiences with others, form political coalitions across a region or the globe, and add their voices to world affairs. Greater connectivity will also help fulfill the nearly insatiable human thirst for information and expose geographically isolated communities to wider horizons and new opportunities, which could create a more modern social and political outlook within a single generation.

Fortunately, the drive to create universal digital access already has powerful political support. The Digital Opportunity Task Force, launched in July, 2000, has brought together developed and developing country governments, the private sector, and international organizations to close the global digital divide. Its report endorses the role of ICT in accelerating development and lays out a 9-point Genoa Plan of Action.[3] A parallel report by the Digital Opportunity Initiative, a coalition of UNDP, the Markle Foundation, and Accenture, argues that ICT, if pursued using a development-centered strategy, can lead to self-sustaining development enabling a country to leapfrog ahead.[4]

Not everyone agrees that new technology can catalyze human development. Gates, among others, has argued that people who live in absolute poverty need adequate food, clean drinking water, and basic health care far more than they need personal computers.[5] Indeed, few would disagree with such a claim. But access to communication networks or the Internet—whether through shared village phones, community cybercafés, neighborhood kiosks linked by wireless, or other emerging technologies—can help people at all economic levels to meet their basic needs. Even an illiterate farmer could use a phone and an automated voice-recognition system to check crop prices. A woman visiting a

rural health clinic could use a similar system to obtain information about AIDS she might be too embarrassed to request from a health worker.

THE POOR AS A SOURCE OF INNOVATION

Distinguished business scholar C.K. Prahalad, in a lecture delivered after receiving the Shastri Award from the President of India, points out that poor communities are already beginning to use digital technologies to create sustainable solutions to the challenges they face.[6] Indeed, he argues that large corporations cannot afford to ignore the poor as a market or as a source of innovation, if they wish to avoid being blindsided by new competitive threats. A number of innovative experiments already underway illustrate Prahalad's point and suggest that achieving global digital access and jump-starting development may not be as difficult as many think.

Rural Bangladesh, for example, where average incomes are less than $200 per year, might not seem like promising territory for a mobile phone company. But GrameenPhone has shown otherwise. In partnership with the renowned microfinance trailblazer Grameen Bank, it has pioneered a new model for rural telephones based on shared access—one phone per village—operated by a local entrepreneur. The bank loans a villager, usually a woman, the money to buy a mobile phone; she sells access to the phone to her neighboring villagers, who pay for calls in cash. As documented in an independent study by the Canadian International Development Agency and a more recent analysis by the World Resources Institute,[7] such village phones have been a commercial success, each phone generating revenues that average $90 per month—twice what the company earns from its urban mobile phones. The pent-up demand for telephone service and the ability and willingness of poor people to pay for it have turned out to be enormous. Not only are the phones profitable; they have also been a social success, providing economic benefits and improving the lives of villagers in ways that put most antipoverty programs to shame. Incomes of the phone entrepreneurs have risen sharply. And phone calls can now substitute for a trip to the city that would cost villagers ten times as much as a call. The village phones have helped people working abroad send money to their family back home, enabled farmers to get fairer prices for their crops, and allowed people to discuss funerals or other important occasions with relatives.

Poor communities are already beginning to use digital technologies to create sustainable solutions to the challenges they face.

If a rural telephone program can work in Bangladesh, one of the world's poorest countries, why not everywhere? And why

stop with simple phone service, when a wireless digital network can also provide rural communities with e-mail, Internet access, or a host of other services, as the Indian company n-Logue is trying to do?[8] Or why not use a franchised network of telecenters to provide very inexpensive access to one-third of a country's population, and pay for it by generating local business based on local content, such as courses in how to rebuild homes destroyed by earthquakes, as the El Salvadorian NGO Infocentros is attempting?[9] Many other experiments are under way. They include LINCOS, a joint venture of the MIT Media Lab and a Costa Rican foundation, which transforms abandoned shipping containers into digital community centers with Internet access and places them in remote villages throughout Central America. The centers provide education, health, and financial services, as well as access to entertainment and telecommunications. Meanwhile, TARAhaat, an ambitious business startup organized by a widely-praised Indian development group called Development Alternatives, aims to create jobs and provide a broad suite of services for poor communities in rural India through village kiosks and Internet-based information systems linked to a digital network.[10]

E-commerce can also be tapped for social purposes. In Argentina, a novel public-private partnership will soon supply affordable Internet access and educational services from the Education Ministry, bringing the country's schools and some ten million students on-line.[11] The costs of the system and of student access are being financed in part by a new private company that will raise money from advertising and e-commerce rights. The combined effort will train the workers (Internet-savvy college graduates) that Argentina needs to enter the virtual economy and jump-start the country's e-commerce marketplace, all without massive public investment. Such a program could be cloned rapidly in many emerging markets.

MICRO-FINANCE, MICRO-POWER, AND MICRO-MEDICINE

Another successful strategy for increasing prosperity worldwide builds on the intensifying competition for customers among banks and other large financial entities, and relies on the power of new digital systems to track millions of customer accounts while steadily lowering transaction costs. It is a bitter irony that offers for credit cards and home equity loans clog mailboxes in countries such as the United States, while as many as 500 million people in poor countries have no access to credit at all. Yet extensive micro-loan programs are starting to change that, typically with unsecured loans of $100 to $500. Successful micro-finance systems usually create groups of borrowers who are jointly responsible for repayment. They make weekly payments on loans, and usually have default rates of less than three percent—a better record than most consumer loan portfolios in the United

States. Micro-loans have proven to be a core development tool, enabling borrowers to expand small businesses, invest in fertilizer to increase crop yields, or otherwise improve their circumstances.

Despite charging interest rates as high as five percent a month, virtually all micro-finance organizations remain nonprofit entities that depend on donor capital to support or expand their operations. The primary reason for this is high transaction costs: without the promise of profit, commercial banks are unwilling to finance such loans. But digital tools are beginning to lower costs. PRIDE Africa, a micro-finance organization operating in East Africa, manages its loans digitally and is beginning to combine and package them in ways that would let it intermediate between its clients and commercial banks.[12] In effect, PRIDE hopes to loan the bank's money, profitably, allowing it to expand rapidly and provide financial services to many poor communities. Of course, no nonprofit entity has the technology to manage even rudimentary financial services on a scale big enough for the half-billion people who cannot get a loan.

Citigroup does, however. It is already experimenting with kiosk-based banking services for small depositors (with a $25 minimum) in India. Suppose that Citigroup or other global financial companies were willing to digitally link corporate capital and processing power with micro-finance organizations on the ground. With lower transaction costs, micro-credit could become a commercially attractive business, vastly expanding the financial resources available to poor communities and accelerating bottom-up development. At the same time, banks could develop new relationships with tens of millions of potential customers for more sophisticated financial services.

Access to both connectivity and credit would expand people's options and accelerate development. And still other possibilities exist to provide basic services via the private sector or novel partnerships. For instance, poor communities need electric power, but are often located far from power grids. Micro-loans could enable such communities to buy small, self-contained solar-power packs just large enough to run a small water pump, recharge a mobile phone, power a radio, or keep vaccines cool in a community health clinic. Solar power has languished in the developed world, but a huge new market for micro-power could exist in rural parts of developing countries; indeed, an innovative small company, the Solar Electric Light Company, has been tapping that market for years, and now both Shell and BP are exploring it too. And with cell phones or Internet links to report diseases and order vaccines and other medicines, new partnerships between NGOs and pharmaceutical companies (or India's emerging manufacturers of generic copies of many medicines) could discover large new markets for low-priced basic medicines packaged in disposable self-injectors.

Micro-power, micro-medicine, and micro-finance may sound like very modest businesses, but multiplied by three or four billion potential customers, they become huge enterprises.

RADICAL TRANSPARENCY

Access to new technology and credit will not be enough, however; poor communities also need simple justice. Such justice must include protection from the dangerous or unlawful actions of private interests or corrupt governments—especially in developing countries, where regulations are often weak or unenforced. One way to achieve this protection would be for NGOs and community groups to form global networks, linked through the Internet, and then work together with leading companies or trade associations to establish environmental and social standards. These groups could then monitor corporate performance against those standards, even in developing regions, exposing companies that employ child labor, cut down old-growth forests, or defy other social and environmental expectations. Such networks could also root out and reveal corrupt officials or help protect poor farmers from land grabs. Such efforts, and the greatly enhanced transparency they bring, would be less expensive, more flexible, and more effective than government regulation, especially in developing countries.

Such ideas are already rapidly becoming a reality in the forest sector, with the creation of Global Forest Watch (GFW) by the World Resources Institute. GFW is a worldwide network of local forest groups linked via the Internet and equipped with advanced software tools. It combines satellite imagery with detailed on-the-ground data collection, compares actual forest practices with lease agreements and established standards, and posts the resulting data and maps on the Internet, naming the companies and countries involved. GFW has also demonstrated a novel model for partnership between the private sector and civil society, a model that is changing the market for forest products. Ikea, Home Depot, and other major retailers of forest products have committed to using only wood that comes from properly managed forests, and these companies are working with GFW to implement those commitments, using the network's growing country-by-country and company-by-company databases. Similar global networks to monitor fisheries, other extractive industries, and the environmental performance of governments are under consideration.

Micro-power, micro-medicine, and micro-finance, plus connectivity, multiplied by three or four billion potential customers, become huge enterprises.

Imagine the public pressure civil soci-

ety will be able to bring to bear on companies, industries, or even governments a few years hence. A network of several hundred local groups, each equipped with miniature video cameras small enough to hide in a purse, could exercise tremendous influence. The cameras could be linked to the Global Positioning System (GPS), so that each frame of video would be stamped with the time and the location—creating evidence that would be hard to dismiss. Footage from each camera could be transmitted instantly over the Internet. The result would be a kind of radical transparency: the equivalent of CNN everywhere, all the time. No contentious action would go unnoticed and unpublicized. Although such extreme efforts might be uncommon, such greatly increased transparency will affect virtually all organizations, public and private. Global NGO networks may prove a better check on the power of global corporations than are national governments.

The Internet has already begun to make censorship virtually impossible, as governments around the world are discovering. When Slobodan Milosevic tried to shut down the Belgrade radio station B-92 late in 1999, journalists simply broadcast their reports over the Internet, giving Serbs and the world at large access to firsthand accounts of the protests that eventually toppled the Milosevic regime.

These examples suggest but do not exhaust the possibilities for empowering the have-nots of the world. The examples have several things in common: they use novel partnerships and build on the digital networks being put in place by the private sector to deliver development services or protect environmental resources on a very large scale. And they suggest new ways of "privatizing" the delivery of basic services—whether they relate to connectivity, credit, or justice—to support a bottom-up, self-help development model.

WHO WILL PAY FOR PROGRESS?

It is commonly argued that a lack of money is the primary barrier to helping the poor, keeping the peace, or protecting the environment. But if governments really want to tackle such projects, the means are readily available. For example, governments could agree by treaty to tax the global economy for what are essentially global purposes, with the proceeds going into a global fund to pay for services such as development and peacekeeping. International flows of trade, capital, and information have been growing much faster than national economies: nearly 9 percent a year for international trade, nearly 20 percent a year for international capital flows, and an even higher rate for international flows of digital information (data traffic on the Internet is growing at about 100 percent annually). The value of these international transactions is huge: currency transactions alone add up to more than US$1.5 trillion a day. One reason for such staggering growth may be the

absence of taxation. This means that, in effect, the global economy currently gets a free ride, since it is not taxed at a global level. Yet a tariff on currency transactions at a rate of a quarter of one percent—so low as to be invisible to anyone except currency speculators—would raise US$750 billon per year. Even in the new economy, that would be real money.

Such a tax may not be a practical strategy. But discussing it makes clear that the real problem in achieving the goals set out above is not a lack of money. Rather, it is a lack of the political will to use government to tackle the underlying problems. Even if adopted, however, a governmental strategy would embody the kind of top-down approach to development that has not worked very well in recent decades. A far better way to make progress may be, in effect, to "hire" the private sector to provide basic services and to empower civil society to work with and monitor the private sector. In some cases, market incentives may be required. But enlightened capitalism coupled with creative philanthropy will probably suffice. An important prerequisite, of course, is that government set rules and enforce laws that make markets work.

There is certainly no shortage of capital to support promising new business ventures. In fact, venture capital may need to go global; there has been too much money chasing too few good ideas in the United States, and competition for higher rates of return will increasingly lead venture capital groups and major corporations to seek unexploited opportunities in other parts of the world. Venture financing stimulates innovation at a very rapid pace, far faster than any other social mechanism yet devised. And rapid innovation—the invention of new ways to provide basic services, of new ways for people to earn a living or improve the quality of their lives—is what is needed to accelerate development, especially in poor societies. The novel strategies described above should have both ample capital and powerful commercial incentives behind them, for they involve more than half of humanity—a huge untapped market.

Building on emerging digital networks to forge new kinds of partnerships and combine public policy with private action is more than plausible.

There is also no shortage of philanthropic capital to support the expansion of civil society and experimentation with novel partnerships and boundary-crossing strategies. Indeed, we seem to be entering into a golden age of private social investment, as new wealth is rapidly recycled into bold philanthropies. Building on emerging digital networks to forge new kinds of partnerships and combine public policy with private action is therefore more than just

plausible. It offers our best hope yet for creating a world that is not just richer, but genuinely better. ■

Notes

[1] An earlier version of this article appeared in the March/April 2001 edition of FOREIGN AFFAIRS. See the Fortress World scenario in the author's *Which World?: Scenarios for the 21st Century* (Island Press, Washington, DC, 1998; Earthscan, London, 1998; Toppan, Tokyo, 1998; Gerling Akademie Verlag, München, 1998; Hurumm, Inc., Seoul, 2000).

[2] See the country case studies in the final report of the Digital Opportunity Initiative, *Creating a Development Dynamic* (UNDP, Markle Foundation, Accenture, June, 2001).

[3] *Digital Opportunities for All: Meeting the Challenge* (Digital Opportunity Task Force, May, 2001), available at http://www.dotforce.org/reports/DOT_Force_Report_V5.0b.doc).

[4] *Creating a Development Dynamic* (UNDP, Markle Foundation, Accenture, June, 2001).

[5] "Bill Gates Turns Skeptical on Digital Solution's Scope," *New York Times*, November 3, 2000.

[6] C.K. Prahalad, "India as a Source of Innovation," (New Delhi, September 30, 2000), available at http://www.digitaldividend.org/pdf/0203ar03.pdf.

[7] See executive summary at http://www.digitaldividend.org/action_agenda/action_agenda_01_GP3.htm.

[8] See executive summary of n-Logue case study at http://www.digitaldividend.org/action_agenda.

[9] See executive summary of Infocentros case study at http://www.digitaldividend.org/action_agenda/action_agenda_01_IF3.htm.

[10] See executive summary of TARAhaat case study at http://www.digitaldividend.org/action_agenda.

[11] See executive summary of Educ.ar case study at http://www.digitaldividend.org/action_agenda.

[12] See executive summary of PRIDE Africa case study at http://www.digitaldividend.org/action_agenda/action_agenda_01_P3.htm.

Global E-Commerce Policies SEEN FROM the South

by SOMKIAT TANGKITVANICH

A number of global e-commerce policy proposals have been advanced by international bodies, governments and academics in developed countries. The issues need to be assessed from a Southern world perspective. Some data are presented here from Thailand and East Asia as part of an attempt to reflect the interests and viewpoints of developing countries. The author, Somkiat Tangkitvanich, is the Research Director for Information Economy, Science and Technology Development Program, Thailand Development Research Institute (TDRI).

DIGITAL DIVIDES

It is broadly known that e-commerce infrastructure and e-commerce-related activities are highly concentrated in a few developed countries, especially the US. Such lopsided development creates a "digital divide"—countries with high levels of development measured by income per capita have the widest Internet penetration. Thus, with less than 5 percent of the world's population, the US is home to over 25 percent of all Internet users. This "access divide" inevitably translates into differences in the use of e-commerce, the "commerce divide." Currently, approximately 85 percent of the world's e-commerce web sites are US-based, with Western Europe and Asia making up almost all of the rest. Due to these disparities, global e-commerce policies proposed by developed countries may not necessarily be appropriate for developing countries. It is important for developing countries to assess these proposals carefully from their own perspectives.

The US is the most active nation in

advocating its policies on global e-commerce. Its vision on developing the global platform for e-commerce is articulated in "The Framework for Global Electronic Commerce" (White House, 1997). The framework laid down five principles:

- 1. The private sector should lead.
- 2. Governments should avoid undue restrictions on e-commerce.
- 3. Where governmental involvement is needed, its aim should be to support and enforce a predictable, minimal, consistent and simple legal environment for e-commerce.
- 4. Governments should recognize the unique qualities of the Internet.
- 5. Electronic commerce over the Internet should be facilitated on a global basis.

In addition to the above principles, the framework also discussed certain key policies and strategic directions. Among other things, it proposed that the telecommunications market be liberalized, that the Internet be a tariff-free environment for trade in goods and services, that the commercial code be harmonized, and that intellectual property rights be strongly protected (see box 1 for more details).

This assessment of the "commerce divide" covers five areas: liberalization of the telecommunications sector, taxation, trade negotiations under the GATS (General Agreement on Trade in Services), harmonization of e-commerce-related commercial laws, and protection of intellectual property rights.

LIBERALIZING THE TELECOMMUNICATIONS MARKETS

Telecommunications is an indispensable infrastructure for e-commerce. Monopoly control of the sector in many developing countries has retarded their entry into cyberspace. In Thailand, for example, although the retail Internet access market is quite competitive, with 18 companies operating as Internet service providers (ISPs), the wholesale market (for international access) is still monopolized by the Communications Authority of Thailand (CAT). The state monopoly adversely affects a wider adoption of the Internet in the country in many ways.

First, the cost of Internet access in Thailand is significantly higher than in many other Asian countries (figure 1). While the price of a 20-hour dial-up Internet service in Thailand is comparable to most other Asian countries, a 64-Kbps leased line costs significantly more in Thailand—about six times more than Hong Kong, four times that of Japan, 2.7 times that of Malaysia, and 2.6 times that of the Philippines.

A previous study showed that, due to the monopoly, the number of Internet hosts—the computers connected to the Internet—is significantly lower in Thailand than in other countries with comparable gross domestic product (GDP). More generally, econometric analysis showed that, on average, there will be 557 more Internet hosts for every billion dollars of GDP in a country with a competitive international telecommunications market

Box 1—ISSUES DELIBERATED IN THE US FRAMEWORK FOR GLOBAL ELECTRONIC COMMERCE

Financial Issues

Customs and taxation: The US will advocate in the World Trade Organization (WTO) and other international fora that the Internet be declared a tariff-free environment whenever it is used to deliver products or services.

Electronic payments: As electronic payment systems develop, governments should work closely with the private sector to ensure that governmental activities flexibly accommodate the needs of the emerging marketplace.

Legal Issues

'Uniform Commercial Code' for electronic commerce: The US supports the adoption of an international set of uniform commercial principles for electronic commerce through internanational fora, including the UNCITRAL.

Intellectual property protection: The US supports the adoption of international agreements that establish clear and effective copyright, patent, and trademark protection.

Privacy: The US will engage its key trading partners in discussions to build support for industry-developed solutions to privacy problems.

Security: The US will encourage the development of a voluntary, market-driven key management infrastructure that will support authentication, integrity and confidentiality.

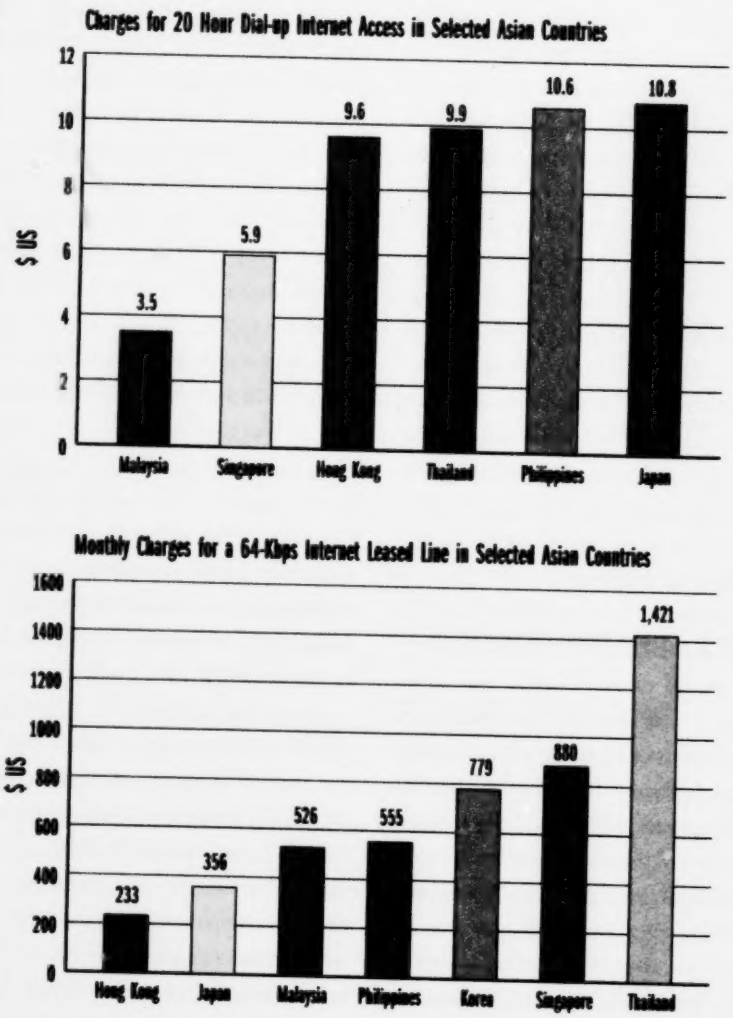
Market Access Issues

Telecommunications infrastructure and information technology (IT): The US will seek effective implementation of the WTO's Basic Telecommunications Agreement and the Information Technology Agreement to ensure global competition in the provision of basic telecommunications services and removal of tariffs on IT products.

Content: The US supports the broadest possible free flow of information across international borders.

Technical standards: The US urges industry-driven multilateral fora to consider technical standards.

Figure 1—COST OF INTERNET ACCESS



Source: *Thailand Development Research Institute*

than in a country with a monopolistic one (Tangkitvanich and Nikomborirak, 1997).

Other state interventions also impose higher costs to the users. In particular, in Thailand, CAT requires that every ISP hand over one-third of its shares free of charge to CAT in return for the concession to operate. The above study also

showed that for an ISP that expects an annual internal rate of return of 30 percent, the equity handout requires an additional 20 percent price markup.

To promote the use of the Internet and e-commerce, Thailand needs to develop a competitive market and a more reasonable regulatory regime. One way to achieve the goal is to liberalize the market to allow more competition from new entrants, domestic as well as foreign, and to set up an independent regulatory body that works in the interests of consumers. In particular, we need to ensure an effective implementation of the Basic Telecommunications Agreement of the World Trade Organization (WTO), as advocated by the US proposal in the Framework for Global Electronic Commerce.

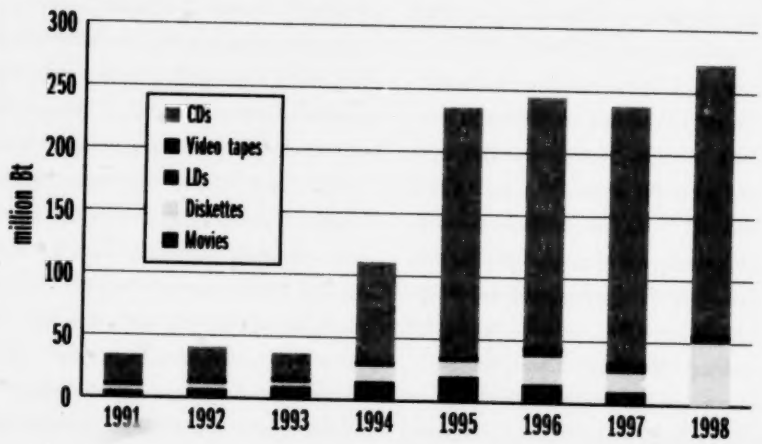
CREATING A TARIFF-FREE ENVIRONMENT

The spread of e-commerce will pose serious problems for the collection of income tax, consumption tax and tariffs. This is due to the difficulties in identifying the parties involved in the transaction, the tax jurisdiction and the content of the transaction itself. Monitoring costs also imposes a greater burden on revenue authorities. Transactions that are most problematic in terms of tax collection are those that involve trade in intangible goods, i.e., software, music, movies and online services.

Let us assess the impact on government revenue collection if tariffs were exempted on digital goods delivered online, as proposed in a WTO Ministerial Conference by the US government. Potentially, digital goods would include all the "information products" that can be digitized, i.e., books, CD-ROMs, diskettes, videotapes and movie films. A previous work showed that tariff revenue that could potentially be lost would average less than 1 percent of total tariff revenue and 0.06 percent of total government revenue (UNCTAD, 2000). In the case of Thailand, Tangkitvanich (2000) found that tariffs collected from information goods constituted only US$ 6.6 million in 1998 (see figure 2), or 0.03 percent of the total government revenue. Thus, tariff exemption would have a negligible impact on government income. Considering the difficulty of collecting tariffs for digitized products, it would seem logical to conclude that imposing tariffs on international transmission is hardly worth the cost of collection.[1]

Since the potential loss in terms of uncollected taxes, particularly consumption tax, from trade in digital goods can be significant, academicians in the OECD countries suggest a shift toward alternative tax regimes to compensate for the forgone revenue. For example, some advocate an increase in the tax on labor wages, since they are probably least affected by e-commerce (e.g., Mann *et al.*, 2000; Bishop, 2000). Others have recommended a reform of consumption tax to a system called a "broad-based consumption tax"—consumption tax based on the difference between a person's income and savings (Varian, 2000).

Figure 2—TARIFF REVENUES FROM INFORMATION GOODS



Source: *Thailand Development Research Institute*

Still others advocate adopting an origin-based taxation instead of the current destination-based taxation in taxing consumption (Office of Tax Policy, 1996).

The argument in this article is that, in the case of Thailand and probably other developing countries, the solutions proposed by developed countries may not be applicable due to different tax structures. In most developing countries, the government would need to widen the tax base by being more frugal in handing out tax privileges for the promotion of investment, cracking down on tax evasion and making the informal sector taxable. A previous study showed that about 81 percent of the tax incentives given by the Thai government to attract foreign investment were redundant (FIAS, 1999). Offshore diesel smuggling alone contributed to an estimated loss of Baht 386-1,285 million to the Thai government in 1997 as evaded tax (TDRI, 2000).

LIBERALIZING ON-LINE SERVICES

There are many puzzling issues about how to treat e-commerce within the organizing framework of WTO. To start with, there are two key questions:

- Traditionally, cross-border transactions are dealt with under either the General Agreement on Tariffs and Trade (GATT) or the General Agreement on Trade in Services (GATS). Since e-commerce involves both digital products and digital services, should GATT or GATS deal with it?
- If e-commerce is classified as a service under GATS, would it fall

under Mode 1 or Mode 2? Mode 1 covering "cross-border supply" is service that is delivered across the national border from a service provider in one country to a consumer in another country. Mode 2 concerns "overseas consumption" where a client from one country travels to another country to obtain consulting services. The problem concerning on-line service provision is that nobody knows where the consumer and the service provider meet in cyberspace. Also, these modes have different trade regimes, restrictions, commitments and benefits.

Many proposals have been advanced to solve the difficulties, including three options analyzed by Tinawi and Berkey (1999).

(1) Combining Mode 1 and Mode 2 services would solve the classification problem, but create a more difficult problem of reconciling differences in the commitments previously made under the two modes.

(2) A second idea is to create a new mode for on-line services—Mode 5[2] (Modes 3 and 4 do not relate to this issue). This would avoid the classification dilemma and does not complicate existing commitments. However, it is still not clear whether an on-line service should be classified in Mode 1, Mode 2 or Mode 5? For example, if a medical practitioner delivers advice over the phone, would this service be classified as Mode 1 or Mode 5? Would the classification change if the advice were instead delivered over the Internet?

(3) A third solution is to classify all on-line services as Mode 2 services, as suggested by some US scholars. This would automatically result in a very liberal trade regime for e-commerce because, in the Uruguay Round, commitments in Mode 2 were clearly more liberal than those in Mode 1 for most countries. Thailand, for example, while it imposes restrictions on overseas consumption of services for all Mode 2 services except management consulting, does not commit to liberalize any of the Mode 1 services.

Bringing all on-line services under Mode 2 will mostly benefit service-exporting countries, most notably the US. Of course, consumers in developed and developing countries will also gain from a more liberal regime. However, we argue that such liberalization would bring about a more open trade regime than foreseen by member states when commitments were made during the Uruguay Round negotiations. Instead, we suggest that on-line services be classified as Mode 1 and that additional commitments be made through further negotiations. This can be achieved by redefining Mode 2 to require physical presence, as suggested by Drake and Nicholaidis (1999). To ensure that all participating countries fully gain, negotiations to increase Mode 1 commitments should be implemented on a cross-sectoral basis.

HARMONIZING COMMERCIAL CODES

The expansion of global electronic commerce depends on the participants' ability to achieve a reasonable degree of certainty regarding their exposure to liability for any damage that might result from their actions. Inconsistent local tort laws, coupled with uncertainties regarding jurisdiction, could substantially increase litigation and create unnecessary costs that ultimately will be borne by consumers. The US advocates the adoption of an international set of uniform commercial principles for e-commerce through international fora, including the United Nations Commission on International Trade Law (UNCITRAL).

The UNCITRAL has completed a Model Law for e-commerce that supports commercial use of international contracts in e-commerce. The law establishes rules and norms that validate and recognize contracts formed through electronic means and sets default rules for contract formation. It also defines the characteristics of a valid electronic writing and an original document, provides for the acceptability of electronic signatures for legal and commercial purposes, and supports the admission of computer evidence in courts and arbitration proceedings.

Also of particular importance is the development of trusted certification services that support the use of electronic signatures which will permit users to know who they are communicating with on the Internet. To promote the growth of a trusted electronic commerce environment, the law that governs the use of electronic signature needs to be harmonized. The UNCITRAL is in the process of developing a model law for electronic signature. The law would lay a framework for determining duties and liabilities of related parties: signature holders, relying parties and signature issuers. They would also set a standard for recognizing signatures issued overseas, to avoid discriminatory practices.

Recognizing the need to harmonize commercial codes for e-commerce, more than 10 countries have already enacted their e-commerce laws based on the UNCITRAL model law. A growing number of countries, including Thailand, are also in the process of drafting similar laws.

PROTECTING INTELLECTUAL PROPERTY RIGHTS

We will now discuss the problem of intellectual property right protection in the context of e-commerce. In particular, we will analyze the problems of copyright protection for digital products, the conflicts between domain names and trademarks, and the problems of extending patentable subject matters under the patent law to cover business methods.

The US is advocating a worldwide adoption of the World Intellectual Property Organization (WIPO) Copyright Treaty (WCT), which is believed to be the solution to the protection of copyrighted digital works. The treaty not only covers the trade-related aspects of intel-

lectual property rights (TRIPS) agreement as well as the Berne Convention, but also provides new measures to fight against piracy of digital works.

First, the WCT provides for the protection of the "right of communication" or "right of making available" a copyrighted work to combat its unauthorized "uploading" on to a server which would enable its subsequent unauthorized downloading. Secondly, it provides for the protection of "technological measures" to prevent the cracking of passwords, keys, hard locks, etc. Thirdly, the treaty also protects against the removal or alteration of "rights management information," i.e., information, numbers or codes identifying the work, author, rights owner, or terms and conditions of use, etc. As of June 2001, only 26 member countries of WIPO have ratified the treaty. The number is still short of the required 30 to bring the treaty into effect.

Thailand has yet to sign the treaty. However, current Thai copyright law, the Copyright Act of 1992, already provides for most of the protections granted by the treaty. The protections include, among other things, the right of reproduction, the right of rental and the right of communication to the public. The only unprotected rights are the protection of technological measures and the protection of rights management information. Thus, there is no immediate need for Thailand to become a signatory to the treaty.

Concerning domain names, "cyber-squatting" or "abusive domain name registration" appears to be the most imminent problem. It has brought about conflicts between domain name holders and trademark holders. The US and the WIPO are advocating the provision of privileges to famous mark holders with respect to domain name registration and dispute settlement. In theory, such a provision would alleviate the problem of cyber-squatting. In fact, the current conflict resolution mechanism under the rules of the Internet Corporation for Assigned Names and Numbers (ICANN) has implicitly provided these privileges. As of May 2000, about 75 percent of the 327 cases settled under the rules were in favor of well-known mark holders.[3]

It is important to recognize the increasing number of abuses by mark holders. For example, McDonald's, the global fast food company, has sued a number of companies including McWellness (a Swiss health care company), McAllen (a Danish sausage store), McMunchies (an English sandwich retailer), and McCaughey (a Californian coffee shop), claiming that its mark is contaminated by these confusingly similar marks (Economist, 2000).

Thus, such privileges should be granted in a fair and transparent manner. Stakeholders need to have an opportunity to voice their concerns. Governments of developing countries should be urged to follow closely future policy develop-

ments in international fora, especially in the ICANN, an international organization that manages domain names.

Let us now turn to the issue of business method patents. A business method patent is a patent granted to protect a certain way of conducting business. Most business method patents are related to the execution of e-commerce activities on the Internet. As a result, their impact reaches across national borders more rapidly than that of traditional patents.

Traditionally, a patent applies only within the country where it was granted. For example, although a US company has obtained a US patent on an invention, it is still possible for companies in other countries to independently develop and manufacture a similar product and sell it within its territory without violating the patent holder's rights. However, in the age of the Internet, the situation is different. When a US company obtains a US patent for an Internet-related service, consumers from all over the world can use the service over the Internet. If a company from a developing country starts providing a similar service, some US consumers may switch to it. This will mean a loss of business for the US company. The US company may claim that its patent is violated and may take legal action against that company.

We argue that a business method patent works against the benefits of all related parties except patent holders. It may result in a wider "digital divide" between developed and developing countries. Developing countries will lose opportunities to gain benefits from imitating developed countries' method of conducting business on the Internet. Such patents therefore should be abolished. However, if granting such patents proves inevitable, the process should be more prudent, and the protection period should be lowered from a typical 20 years to three to five years.

CONCLUSION

To assess the US-centric proposals, we classified them into four categories according to their impact on consumers and e-commerce producers in developing countries: those that increase both consumer and producer welfare; those that increase consumer welfare, but decrease producer welfare; those that decrease consumer welfare, but increase producer welfare; and those that decrease both consumer and producer welfare.

Proposals that increase both consumer and producer welfare

Examples are the harmonization of e-commerce laws and the liberalization of the telecommunications market. The former will facilitate electronic transactions and will benefit both consumers and producers due to lower transaction cost. The latter will reduce the cost of access to Internet to users (consumers) and e-commerce-related business operators (producers), e.g., ISPs, web hosting service providers, application service providers (ASPs), etc.

Proposals that increase consumer welfare, but decrease producer welfare

An example is protection for famous marks in domain name disputes, at least in the short term. While the protection helps reduce potential confusion arising from identical or similar marks and thus increase consumer welfare, most producers in developing countries with less-known marks are prone to be unfairly treated in domain name disputes. Another example is the proposal to make the Internet a tariff-free zone for digital goods. Lowering the tariff barriers induces more competition that will benefit consumers, but make life more difficult for domestic producers. However, the extent of the welfare effected on consumers and producers in this case is relatively small since digital goods are already tariff-free in practice. Similarly, treating on-line services as the GATS's Mode 2 services is also classified in this category, since a more liberal regime will increase consumer choice while imposing greater competitive pressure on domestic producers.

Proposals that decrease consumer welfare, but increase producer welfare

An example is the worldwide adoption of the WIPO Copyright Treaty which will bring about stronger protection for local software producers, hence increase their welfare. However, as most developing countries are software-consuming countries, the benefit from stronger protection is unlikely to offset the loss in consumer welfare due to the monopoly granted by the copyright protection.

Proposals that decrease both consumer and producer welfare

Extending patentable subject matters to include business methods will decrease welfare of consumers and producers in developing countries. This is because the producers will not be able to exploit the patented business methods freely. As a result, they may be forced to use less efficient methods in providing their services. Part of the cost will be passed on to their consumers.

Proposals that increase consumer and producer welfare should be implemented with no hesitation. Proposals that increase consumer welfare, but decrease producer welfare should also be implemented in most cases. However, developing countries need to ensure that global e-commerce policies in these areas are sufficiently well balanced. For example, famous marks must not be given unreasonably privileged protection. To achieve that, developing countries must take more active roles when participating in international fora, e.g., the ICANN. On the contrary, proposals that significantly decrease consumer welfare, but trivially increase producer welfare like adopting the WCT should not be implemented unless developing countries are compensated fairly by the developed countries that are likely to gain considerably from the implementation. Compensation could be in the form of liberalization of certain markets in developed countries that will bring about significant benefits to developing countries, e.g., the agricultural sector.

Developing countries should form alliances with one another to tackle critical policy issues—those that clearly decrease the welfare of consumers as well as producers in our countries. In some cases, the alliances should be extended to parties in developed countries with similar stances. Concerning business method patents, for example, many not-for-profit organizations and even some business leaders in the US also advocate the abolition of such patents. These groups of people can be powerful allies. ■

Note

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Notes

[1] For consumption tax collected from trade in digital goods, however, the potential loss is significantly greater. The issues need to be addressed more carefully and are beyond the scope of this article.

[2] E-commerce will also impact other modes of services. For example, laws and regulations that require commercial presence will limit activities of 'pure' on-line service operators. Again, due to space limitation, these issues are not discussed here.

[3] See ICANN's web site (www.icann.org) for more information concerning the rules and the cases settled.

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Building Foundations for E-Commerce in Hong Kong

by JUDITH HOLLOWS & CHUN KIT LOK

Breaking with the past, new government policies and initiatives seek to make Hong Kong an innovation-led, technology-intensive, "new economy" center for southern China and east Asia. An important platform for this drive is information technology which can help in the development of e-commerce, if used more strategically by Hong Kong firms and encouraged by the government. Other developing countries might profit from this case study by two authors from Hong Kong Polytechnic University — Dr Judith Hollows, School of Design, whose research focuses on Hong Kong and east Asian firms; and Chun Kit Lok, Department of Management, whose main concerns are MIS and E-commerce development and applications.

INTRODUCTION

The economy of Hong Kong has several characteristics which do not foster the development of e-commerce. The economy has a weak foundation of technological innovation, a mass of small firms with little non-market coordination among them, and a 'state' which has historically played an arm's length role in the development of industries. The technological

base needs upgrading, especially when compared with the other newly industrialized countries of Singapore, Taiwan and South Korea. To enable e-commerce, the structure for generating products and processes based on information and communication technology needs strengthening.

In 1998, within a few months of the British hand-over to the People's Republic of China, the new government of the Hong Kong Special Administrative Region (SAR) launched a Commission on Innovation and Technology. Its intention was to develop Hong Kong into an 'innovation-led, technology-intensive economy' (1998:v). This initiative and others signaled a break with the colonial past and the former government policy of "positive noninterventionism." The new institutional arrangements were implemented at the same time as the explosion of investment in dot.com firms and the emergence of the "new economy" (OECD, 2000). Information technology was identified as one of several areas for development; others were design and fashion, Chinese medicine, high value-added components and products, and multimedia-based information. The recommendations included institutional arrangements to enhance the physical infrastructure, support for an incubation programme, strengthening support for research and development, rationalization of the institutions for the diffusion of technology and productivity, and the development of human capital (Commission on Innovation and Technology, 1999:16-18).

The following initiatives among others were launched in 1999 to support the development of the 'new economy'. First, a new Nasdaq-style board, the Growth Enterprise Market, was set up to encourage the funding and development of newly founded higher technology firms. Second, an Electronic Service Delivery scheme for on-line government services was initiated. Third, legislation to support the security of electronic transactions was introduced. Fourth, the development of a Cyberport to create a strategic cluster of leading information technology companies was announced. Fifth, progressive liberalization of the local and external telecommunications markets continued (*Hong Kong, 1999*: 338-345). These developments occurred contemporaneously with a collapse of the property market following the onset of the Asian financial crisis in 1997. This fortuitous conjunction of events brought about a repositioning of Hong Kong's powerful property development firms, which became the vanguard in the development of information and communication technologies (ICTs) in Hong Kong. They invested in telecommunication infrastructure projects such as fixed-line networks, and took their position in the up- and midstream sectors among the very few local firms with sufficient financial and human capital resources to do so.

To see how e-commerce can develop in Hong Kong, it is first necessary to understand the nature of technological competencies in the economy and the

nature of the firm, and to trace how entrepreneurial competencies emerge for developing a new technology business such as e-commerce in a fragmented business environment (Whitley, 2000). These factors are discussed within an "innovations systems" framework, following approaches outlined in several studies (such as Cooke & Morgan, 1998).

THE INNOVATION SYSTEM IN HONG KONG

Hong Kong firms are limited in their generation of new products and businesses using new types of technology. This is because of their entrenched dependency on market developments in USA, Europe and Japan, weak support from the state, and the nature of the financial and educational systems. However, Hong Kong firms are skilled as second or third movers in terms of innovations in products and processes (Teece, 1986). Their accumulated know-how in Original Equipment Manufacturing (OEM) enables them to imitate and improve on initial designs, and they can move faster than the originator in capturing consumer demand. They do this by adapting the original design for low-cost manufacture in China, and then distributing the product to mass markets through established networks of trading companies, wholesalers and retailers. The essence of Hong Kong's innovation system is competency in the speed and volume of manufacturing to meet massive demand for fashion-oriented or seasonal consumer items. This pattern is called "buyer-led commodity chains" (Gereffi and Korzeniewicz, 1994). It is particularly successful in manufacturing light consumer goods under license or subcontract arrangements for brand-owning companies in USA, Europe and Japan (the triad countries). Trading companies and manufacturers in Taiwan and Hong Kong, in particular, play a crucial intermediary role in this Original Equipment Manufacturing system (Yu, 1997).

The complementary assets of Hong Kong firms are connections with world class retailers, an efficient port infrastructure, and linkages into a huge intermediate industries structure of parts and component suppliers. The focus on low-cost, low-technology manufacturing and trading enables low switching costs among similar kinds of products and businesses. The mass of small firms draws on the resources and competencies of networks of firms with production facilities in China and connections with buyers from the USA, in particular, to mobilize a huge volume of trade—Hong Kong is ninth in the world in terms of value of trade. This position in the world economy supports a financial services sector that has a significant ranking in the world in terms of banking, loan syndication, stock market, financial derivatives, foreign exchange, and gold bullion; and is Asia's largest centre for insurance companies and venture capital (HKTDC, 2000:i). The financial services sector is sustained by a world class telecommunications structure and an independent and trusted legal system not found elsewhere in China.

Hong Kong's innovation system is thus based on the manufacture of low or mature technology, low-cost, light consumer and intermediate products, and a service sector which includes international business, financial and communication centres. There are doubts among policy makers that Hong Kong can maintain its world leadership in trading through this division of labor with Mainland China for the production of several categories of light consumer goods. As a consequence, the policy of the Hong Kong SAR Government is to promote "innovation and technology" as the platform for future economic growth (Chief Executive's Commission on Innovation and Technology, 1998, 1999.)

Several reports and studies demonstrate the need for this new policy emphasis. A report by The World Economic Forum (2000) indicates that Hong Kong had fallen from third place in global competitiveness in 1999 behind the US and Singapore, to eighth place in 2000. That position is based on several indices which illustrate Hong Kong's strengths and weaknesses. It was ranked 2nd after the USA in the *start-up index*, 12th in the world in respect of *economic creativity*, but 30th. in the *technology index*. The low technology ranking reflects Hong Kong's low level of incentives to encourage technological innovation such as intellectual property protection, support for technology transfer, and business linkages with science and technological development.

Similar findings emerged from several studies of the changing nature of the Hong Kong economy and technology development in Hong Kong industry (Berger & Lester, 1997; Enright *et al.*, 1997; Kwong, 1997), according to the conditions for technological creativity outlined by Mokyr (1990). These studies identified a cadre of ingenious and resourceful entrepreneurs, a diversity and tolerance of changes to the status quo, but weaknesses in the incentive structure to support developments into higher technologies. The Commission on Innovation and Technology (1999) recognized information technology as an important platform and proposed a range of institutional developments to support Hong Kong as an innovation centre for southern China and the region. However, developments in e-commerce are currently constrained by the way in which information technologies are deployed in firms.

Hong Kong's information technology structures at the level of firms are simple, reflecting the average size of firm of about eight employees in Hong Kong, and relatively low-technology, labour-intensive manufacturing operations in China, in which several hundred employees are engaged (Sung, 1998). In information technology, firms in Hong Kong and their operations in China are at three different levels, based on the typology of Nightingale and Poll (2000:117-118). First are the "craft" level firms, which have only one or few servers, a decentralized architecture, and limited advantages of scale

and scope; also, they are process-oriented rather than product-oriented, make and buy software, and have craft-based maintenance. Second, a few very large private sector organizations in the financial services, telecommunications, shipping and logistics sectors, and large trading firms (HKTDC, 2000:35-36) are at the "mass standardized" level; they have more than 100 servers, a centralized architecture, and advantages of scale and scope, are product-oriented, make and buy software, and have standardized maintenance. Third, only multinational firms and a handful of organizations are at the "complex" level of more than 1,000 servers, a centralized architecture, system advantages, bundled products and processes, in-house developed software, and very complex maintenance. Examples of these are the Hong Kong Stock Exchange, The Hong Kong Jockey Club, Cathay Pacific Airways, and the SAR Government.

In information technology, many Hong Kong firms are at the "craft" level, a few at the "mass standardized" level, and only a handful at the "complex" level of more than 1,000 servers and centralized architecture.

In addition to this mainly simple information technology structure at firm level, there is strong reliance on imports of key components in manufacturing industry and in the telecommunications equipment, electronics, and information technology sectors (HKTDC, 2000b). Hong Kong's role in the global production system for the computer industry, for example, is primarily as a coordinator of low-end assembly operations in China. In comparison, Singapore is a major producer of disk drives, printers and sound cards, and Taiwan leads in the production of notebook PCs, motherboards, and a wide variety of components and peripherals (Kraemer & Dedrick, 1998; McKendrick et al, 2000). A study of the electronics industries of east Asian countries characterizes Hong Kong as lagging behind Taiwan, Korea and Singapore in technological capability (Hobday, 1995:184). Its evolution from Original Equipment Manufacturing to Original Design Manufacturing (OEM to ODM) and to development of its own brands is slower and in less complex goods than the other three countries. In those countries and in Japan, state intervention has succeeded in the areas of innovation and technolgy, while Hong Kong's former government played little role in fostering industry.

The innovation strategies of most firms in Hong Kong are largely of the "dependent" type, according to Whitley's typology (2000:871-876). They organize well-known product qualities within widely understood frameworks that rarely involve the development of radically new elements, but are highly responsive to

changing customer needs and differentiated demands. Knowledge tends to be highly industry specific, mostly tacit and simple, except when it involves extensive production and distribution-chain coordination (*ibid*: 871). The "business system" associated with such innovation strategies is described by Whitley as "fragmented." The business environment is adversarial and unpredictable and discourages long-term commitment of any kind, except to those with very strong personal ties. The state environment does not have definitive policies for encouraging technological development or pursues it in an *ad hoc* and inconsistent manner (*ibid*: 875-876).

What are the implications of this fragmented, low-technology, and dependent business system for the development of e-commerce? They can be identified by examining six components which are found in successful innovation systems (Cooke and Morgan, 1998:25-27), in relation to Hong Kong's innovation system, and by reviewing developments in e-commerce against this background.

1. Research and development

The lack of research and development in firms leads to a virtual lack of science-based technological development (Chiu *et al.*, 1997:61-64; Kao & Young, 1991). There has been little joint collaboration between universities and Hong Kong firms. This is one of the key issues addressed by the Commission on Innovation Technology (1999: 47-54).

2. Education and training

The education system has been retarded by British colonial policies. Centralized government control over education activities in schools was exercised through quantifiable measures which promoted certification and rote-mindedness, according to scathing comments by Yee (1989, chapter 4). Technical and vocational programmes are readily available but lack prestige. By the mid 1980s only 5 per cent of the 17-20 age group were admitted to full-time tertiary education; by the mid 1990s this had increased to 18 per cent (Suen & Chan, 1997:23). Labor and manpower policies are trapped in "an impasse of legislative and administrative disarray, confusion, disequilibrium and contradictions which have persisted since the inauguration of the new SAR Government," as described by Ng (1998:128). Standards of English language skills in Hong Kong and Mainland China compare unfavourably with Singapore and India, and that is a significant issue in current software developments (SCMP, 6 April, 2001).

3. Financial system

Hong Kong is feted as an international finance centre. Of the top 100 banks in the world, 78 have operations in Hong Kong. It has a mature and active foreign exchange market, and the stock market is one of the world's largest in terms of market capitalization (*Hong Kong* 1999:68-69). However, the government has never set up an industrial bank, and

has been reluctant to make financial resources available for industrial deepening or restructuring (Chiu *et al.*, 1997:134). The dominance of the financial and commercial classes in Hong Kong's political elite has presented a formidable obstacle against support for industrial upgrading (Choi, 1999:151). The opening of China since 1979 has led to the resuscitation of Hong Kong's entrepôt trade, and the fast development of its financial markets to serve China's insatiable need for capital Also the cheap land and labor available in China has enabled continued emphasis on low-cost, labour-intensive manufacturing (Choi, 1999:156). The prevalence of subcontracting stimulates the growth of small and medium enterprises in the context of an unhelpful government and the reluctance of banks to lend them money (Lee, 1999:165). All new business development is subjected to requirements to show gains in the short term. Few venture capital firms have shown interest in financing R&D and technological upgrading, and investors in the stock market have a low level of tolerance for long-term strategies with uncertain outcomes such as large-scale R&D projects (Chiu *et al.*, 1997:139-140).

4. Nature of user-producer relationships

The average size of firms in Hong Kong of around eight employees indicates that each firm undertakes a narrow range of activities, and consequently there is a myriad of user-producer relations, both horizontal and vertical in the value chain. These relations are organized in networks with varying degrees of stability. Networks are the main organizational unit of east Asian capitalist economies (Hamilton, 1996:285-295). Chinese entrepreneurs often do not elect to develop the size of their firms through vertical or horizontal integration, but rather diversify their assets by starting new separately managed firms in other economic sectors. This pattern of diversification is usually opportunistic and done with overlapping sets of partners. The networks represent dynamic industrial structures that reflect changes in local, national and global markets. These structures are path dependent—"where these economic structures start organizationally influences the direction they go and how they change" (ibid:295). Hence the structure of e-commerce in Hong Kong will reflect the dominant mode of economic organization in Hong Kong—networks of small firms emerging from existing social relations.

5. Intermediate institutions

The noninterventionist policy of previous colonial governments included a "divide and rule" strategy towards intermediate institutions such as trade associations to undermine demands for support for the diversification of industry (Choi, 1999:154-155). This has not provided a supportive framework for the development of new industries. Entrepreneurs in a new industry may eventually need to alter institutional

norms and gain both sociopolitical legitimization—for example, for standard setting—and support from government, education and financial institutions (Aldrich & Fiol, 1994:653-660). The Hong Kong Commission on Innovation and Technology recognized these needs, but the proposed institutional changes will take time to mature. In the absence of supporting intermediate institutions, including venture capitalists, e-commerce entrepreneurs minimize their risks by applying/adapting relatively mature ICT products and processes. Hence e-commerce developments replicate the strategies of manufacturers and trading companies in adopting low-cost mature technology strategies.

6. Networks, norms and trust relations

The final consideration for Hong Kong's innovation system is the nature of the social organization of networks, norms and trust relations. Continuing the discussion of the problems of sociopolitical legitimization, as identified by Aldrich & Fiol (1994), founders of new ventures without the advantages of a 'taken-for-granted' activity, have to first call on whatever personal and interpersonal resources they possess. They must interact with sceptical customers, creditors, suppliers and other resource holders, who are afraid of being taken for fools. Entrepreneurs therefore need strategies for trust building which ideally need to be based on external evidence. In the case of Hong Kong, the Silicon Valley business models provide this external legitimization (Nevens, 2000). Discussion of established business models by Hong Kong 'dot.com' entrepreneurs legitimates their strategies. Their educational experience in Ivy League universities and prior employment in leading multinational companies also adds to their credibility.

Founders and employees in Hong Kong's leading e-commerce firms have working experience in leading American ICT or e-commerce firms, and network among an elite group to mobilize resources and gain entry to capital markets.

The leading e-commerce firms have founders and employees with working experience in the USA in leading ICT firms or e-commerce related firms. Their advantage is their ability to engage in personalistic, particularistic networked relationships among an elite group with similar demographic characteristics and employment experiences to mobilize resources and gain sufficient legitimacy to gain entry to the capital markets. These networks are an important feature of the structure of e-commerce in Hong Kong.

THE EMERGING STRUCTURE OF E-COMMERCE

In Hong Kong as in Europe, the diffusion of the Internet economy is dependent on

the consequences of deregulation rather than on the diffusion of entrepreneurial models and venture capital (Casper and Glimstedt, 2001). In Hong Kong, the deregulation of the monopoly on fixed-line networks was replaced by an oligopoly by major property development companies—the only Hong Kong firms with the financial, technical and managerial resources to undertake the investment required to manage fixed-line networks. These resources also supported their abilities to pioneer midstream developments in e-commerce—the application infrastructure and application service providers.

Casper and Glimstedt (2001) identify navigation, middleware, and applications as highly fragmented sectors in the vertical structure of the Internet economy. They define the middleware sector as the production of software that facilitates end-customer information services and connects these information services to the basic transportation layers. These are the AIPs—the Application Infrastructure Providers. Casper and Glimstedt define the application layer as downstream from the middleware sector and as constituted by the creators of platforms used by end-users. These are the ASPs—Application Service Providers.

What is particularly interesting about Casper and Glimstedt's study is that they show how the innovation system of an economy influences the development of a particular set of competencies in information and communication technologies. For example, they find that Swedish e-commerce firms are concentrated in the AIP sector and German e-commerce firms in the ASP sector. Casper and Glimstedt examine these two technological regimes and conclude that AIP technological trajectories are extremely volatile due to quickly changing standards, and that ASP technologies are more stable or cumulative. They identify four competencies that are related to technological regime characteristics—financial risks, standards-related challenges, competency-destruction risks, and skill or human resource requirements. These are all lower in the ASP sector as compared with the AIP sector. Middleware firms face much higher risks due to the technological volatility of the sector, whereas the ASP sector locks in customers because of the high switching costs once customized software, such as a dedicated e-commerce platform, is established. Upgrade cycles then are used to ensure longer-term profitability. The ASP sector can be handled by lower trained technicians with more discrete application-specific skills compared to the AIP sector that requires the formation of teams of highly experienced

The economy-wide innovation system in existence influences what set of competencies in information and communication technologies will be developed.

programmers and engineers.

These findings of Casper and Glimstedt provide an insight into the difficulties that Hong Kong firms face in developing competencies to operate in the middleware sector. Only a handful of firms claim to operate in this sector of the e-commerce value chain. A larger number have a stake in the ASP sector, especially among those entrepreneurs that have prior employment experience with Hongkong Telecom, the previous monopoly holder of fixed-line telephony. Hongkong Telecom plays a similar role in the supply of entrepreneurial talent from among former employees, as did Fairchild Semiconductor in the development of entrepreneurial networks in Silicon Valley (Saxenian, 1990, 1996; Lécuyer, 2000); Ericsson in the development of the technological intensity of Swedish Internet firms (Casper and Glimstedt, 2001); and Nokia in Finland (Unger, 2000). These studies highlight the importance of large firms, often a single dominant firm, as a key source of technological competence in the development of entrepreneurs in the "new economy."

A major difference between Hong Kong, Stockholm and Silicon Valley, however, is the lack of depth of technological expertise in Hong Kong. There are several reasons for this. There was no in-house development of technology, and no R&D function in Hongkong Telecom, a major supplier of 'dot.com' entrepreneurs. Neither is there any significant semiconductor manufacturing industry in Hong Kong, in contrast with Korea, Singapore, and Taiwan, which have benefited from government support for its development. The Hong Kong electronics industry is further downstream in the assembly sector—electronic components are sourced rather than manufactured. Hong Kong as a former British colony and now Special Administrative Region of the PRC does not have its own military establishment as a basis for the deepening the technological infrastructure.

The dot.com entrepreneurs, in the same way as the manufacturers, have to buy in the technologies. The manufacturers source the more complex components and adapt product and process ideas that have been created by brand-owning firms. The 'dot.com' entrepreneurs source hardware and software systems and reconfigure them to meet local market demands. The former monopolistic fixed-line telecommunications firm, together with three leading property development firms which have entered the telecommunications market following deregulation, provide human and financial capital support for the development of new entrants in the 'new economy', in the context of weak institutional support from the state. In addition, networks of former employees of leading firms in the information and communication technology sector, such as Microsoft, are identified as being an important mechanism for knowledge acquisition and transfer to support new business activities (Carlsson

& Jacobsson, 1997). These networks are also important for gaining access to financial resources.

CONCLUSION

Hong Kong's strength lies in the high level of entrepreneurial skills. These meet the classic profile of a Kirznerian entrepreneur who may have technical knowledge but, more important, knows about the development opportunities which are available (Kirzner, 1985:74). In an analysis of Hong Kong manufacturing industry that has equal relevance to developments in e-commerce, Yu (1997) identifies the importance of multinationals from whom local entrepreneurs absorb foreign technology.

This dependent type of innovation strategy (Whitley, 2000) has developed in the absence of domestic bridging institutions. Hence multinational firms provide a crucial anchor for the development of technologies in Hong Kong. They provide the social and financial capital basis for a cluster of e-commerce firms run by '30-something' aged entrepreneurs who are pioneering the midstream sector. These entrepreneurs have similar demographic profiles: technical undergraduate education in the US, perhaps a Masters degree in business administration, an employment history that includes United States ICT multinationals or Hongkong Telecom. They meet the classic profile of a Kirznerian entrepreneur.

We conclude with a discussion about the developments in competencies in the so-called "new economy" as demonstrated by the emerging structure of e-commerce in Hong Kong. Our first observation relates to the path-dependent nature of innovation. Market, product and process developments arising from e-commerce in Hong Kong reflect the current attributes of the nature of Hong Kong firms and their market relations, i.e. small, agile, highly market-oriented, but rarely able to produce new technological innovations.

Our second observation is there are two developments that indicate new forms of business organization may be emerging. These are the growth of the economic power of the conglomerates based on property development, and the emergence of firms based on professional partnerships rather than on family relationships.

The property development conglomerates and their associated firms control the telecommunications market in Hong Kong. Their economic influence extends beyond their firm boundaries through the networks of previous employees—especially former senior executives who have set up 'dot.com' firms in the midstream sector. These firms have been successful in being listed and are now important lubricants for the development of downstream e-commerce through their 'incubation' strategies—an acquisition and development mode of business development in the Silicon Valley mould. The highly educated sons of the founders of the property development firms are beginning to exercise control, and the same generation is also in con-

trol of major trading firms and banks.

The administrative hierarchies of the large telecommunications firms are legacies of former British companies taken over in the 1980s by an earlier generation of leading Hong Kong entrepreneurs (Wong, 1994). These are now controlled by their Ivy League or Oxbridge university-educated sons who have the confidence and financial backing to make business deals with major multinational ICT firms such as Microsoft and Cable & Wireless (see Chan & Ng, 2000, for a discussion beyond family business and a new breed of entrepreneur). Alongside them are found PRC nationals of the same generation—sons of political elites who went to USA and Europe for their education and who are now the emerging technocrats at the head of major PRC corporations and in key positions in government ministries in Beijing. How these two forces will combine to change the economic structure of Hong Kong is unclear. And how Hong Kong will interact with the adjacent Special Economic Zone of Shenzhen, which has a focus on high technology development, is also unclear.

Developments in e-commerce in Hong Kong are a reflection of the path-dependent nature of industrial and corporate change. Despite the weaknesses in the technological base of the economy, the changing social demographics of 'leading entrepreneurs' is accompanying the development of a new form of business organization which is less reliant on family connections (Hamilton and Kao, 1990; Redding, 1990; Wong, 1985), and more reliant on high levels of technical competence. Although the new 'dot.com' firms are small and highly networked, the importance of large multinational ICT firms as a source of technical and entrepreneurial competence is the same in Hong Kong as in other economies. ■

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Making the Software Industry "Open"

by EDWARD WHITE

Are there low-cost, sound and easily adaptable ways for developing countries to benefit from information technology and connectivity by opting for "open source" computer operating systems and software? An overview of this complex and controversial issue is provided by Edward White. He is Director of New York Operations for Development InfoStructure (devIS), an information technology firm, and was formerly UNDP Resident Representative in several countries and Principal Information Officer in the UNDP Special Unit for TCDC.

INTRODUCTION

All across the world a revolution is being waged in information technology—a revolution all but unobserved by many. Yet it cannot be called a "quiet revolution", as the volume gets loud at times, particularly as the battle lines become more sharply drawn and the issues and conflicting interests more clearly defined.

At issue is free or, more accurately, "open" computer software (see definitions below). The open source movement, as it is frequently called, is not fighting for the traditional spoils of war, nor even for profits *per se*, but for the hearts and minds of computer users and

policymakers everywhere who define information technology choices. Ultimately, the conflict is a natural battle between economic forces: those seeking maximum control of the software industry, in search of maximum profits, versus those striving to make the software industry open, bringing lower costs and better products to its consumers.

The matter is of intense interest to the developing world. The critical role of information technology in the development of Third World countries is well recognized. The central issue this article addresses is the contribution that open source software can make to development, in the hope that technical cooperation among developing countries can help augment its benefits.

DEFINITIONS

"Open Source Software" (OSS) is often described as "free software". While true to the spirit of OSS, this appellation has led to considerable confusion in the lay public. In the open source context, "free" means "freely distributable and free of restrictions on seeing, copying, modifying and redistributing" the original *source code* or products (i.e. software) based on it.

Source code refers to the programming statements written in a computer language such as C, C++, Basic, Java, Python, etc. The source code is not directly usable by the computer, but must first be converted into *executable code* ("machine language") by special software known as a compiler, assembler or interpreter. It is this compiled machine language, i.e. executable code, that a user purchases a license to run on one or more computers. Machine language cannot be directly modified. If changes need to be made, the source code must be modified and then recompiled into machine language. What distinguishes open source software is that it provides access to the source code itself.

OSS is usually copyrighted, and its license may contain restrictions intended to preserve its open source status, or to require notices of authorship, or to maintain other developmental control (see box "GNU General Public License").

The open source licensing model, as evidenced by the GNU General Public License (GPL), contrasts sharply with licenses for proprietary mainstream software (i.e., non-open or closed source), whether commercial or custom designed for a client by application developers. For nearly all the major software categories there is an open source equivalent to the commercial product: Sun Microsystems makes StarOffice, alternative to Microsoft Office; Apache web server, alternative to Microsoft Internet Information Server (IIS) or Netscape web server; GIMP (GNU Image Manipulation Program), alternative to Adobe PhotoShop or Corel PhotoPaint; PostgreSQL relational SQL database, alternative to Oracle (Oracle Corporation) or DB2 (IBM).

The licenses for proprietary software contain varying provisions regarding use,

GNU GENERAL PUBLIC LICENSE

The subject of open software licensing generates endless debate, much of it ill informed. "Free" or pure open source software is accompanied by the GNU General Public License (GPL). GNU, meaning "GNU is Not UNIX", is a project of the Free Software Foundation dedicated to the free exchange of software.

In a word, the GPL license, also known as "copyleft" to make a clear distinction from traditional copyright, gives everyone the right to use and modify the material as long as they make it available to everyone else under the same licensing stipulation. Thus, software covered by a GPL is always distributed with the original source code or easy access to it, and this code may be freely used, copied, modified, or redistributed (even as part of a different commercial product, whether or not the original was free of cost), provided that any new or modified product is also distributed under the GNU GPL.

It should be noted that in addition to the GNU/GPL license there are many other open software licensing models, enabling authors to retain any desired degree of control over the software they create (for detailed information visit www.opensource.org.)

copying, redistribution, etc. but generally have strict regulations protecting the intellectual property of the designers and constraining users from copying, sharing, redistributing or reverse engineering the software so that it can be modified. Needless to say, the original source code of such software is classified "top secret" by the companies that distribute it. Such products cannot, of course, be inexpensive due to a number of factors, not the least of which is the desire of the software publishers to continue their high profit margins. Such software is expensive to acquire and may well prove to be expensive to maintain as it goes through the inevitable upgrade cycles.

THE STATUS OF OPEN SOURCE SOFTWARE

Before looking closely at the characteristics of OSS and its innate interest to developing contries, it is necessary to clarify the status of open source software. The fundamental building block of the open source movement is the Linux operating system (see box "So What is Linux?"), an open source derivation of UNIX. Most software created for use on computers running Linux is also open source. It is by far the most widely used platform for open source software.

A distinction needs to be made between computers running "desktop" or end-user productivity software and those functioning as "servers", comput-

ers dedicated to the provision of services such as networks or Internet access and content to *client* computers operated by end-users. In a word, Linux and open source software have become a huge success as servers in a very short period of time (see Table 1—Software in Use at Internet Sites Worldwide).

Linux has not yet taken hold as a desktop operating system, however, although it certainly has the potential to do so in due course (see box "Installing Linux"). The advantages and the promise that Linux and open source bring should be seen in the light of experience such as that recounted in the box. Viewed as an operating system for use as any of a variety of types of server Linux is elegant, powerful, flexible, stable and inexpensive. It certainly can be used as a desktop operating system and shows great promise in this regard, but still requires considerable development to become a system that non-technical users can install and configure without assistance.[1]

NATURE OF THE OPEN SOURCE REVOLUTION

Spirit of openness and sharing

One of the reasons the open source revolution is important to international development is that it recaptures much of the spirit of openness and free exchange of ideas (and intellectual property) of the early days of microcomputing when most computer users were themselves programmers. In such an environment, the special needs of developing countries are much more likely to be addressed, particularly custom computer applications such as using non-Latin character language in almost any type of productivity software.

Intimate connection to Internet proliferation

The continuing rapid growth of the Internet and particularly the World Wide Web creates a special imperative to prevent the "digital divide"—the gap in the availability of information technology services—from adding to the dis-

SO WHAT IS LINUX?

Linux is the trademark name for an open source Unix clone licensed under the GPL. Linux, the core or kernel operating system, was invented in 1990 by a Norwegian computer science student, Linus Torvalds. Since then, Torvalds and a number of other programmers have worked on, improved and added to the tool set of which the Linux kernel is the centerpiece. The operating system available today as free and commercial Linux "distributions" is more accurately called GNU/Linux, although Linux has come to be the generic name used for the system.

INSTALLING LINUX

The author conducted a personal experiment by installing and running trials of four of the current major Linux packages (called "distributions")—RedHat, Caldera, Mandrake and Corel Linux—as strictly desktop operating systems using open source software intended for end-users. The results were sobering.

Basic installation of the systems was more complicated than Windows, but not unduly difficult if the user's hardware was compatible with the particular Linux distribution concerned. However, all four had difficulty recognizing some hardware items now accepted as standard and considered mandatory by most users, including printers, scanners, fax machines and sound cards. More important, post-installation configuration of the many things necessary to make a desktop computer useful is quite difficult, undoubtedly beyond the capabilities of a nontechnical user.

Installation of software that is not installed automatically on initial setup can also be complex. However, once everything is installed and running, day-to-day use of Linux and open source applications is not much different from using Windows.

parity between the richer and the less developed nations. Many people in more developed countries see the Internet as a means of relaxation and enjoyment, and increasingly as a lower cost and more efficient alternative to traditional telephone and postal communication. In the developing world, however, the greatest significance of the Internet will continue for some time to be its use as a means of spreading available information resources to a wider segment of the population, and to provide the country as a whole with a better, lower cost means of accessing the great wealth of information, much of it free, that is now deployed worldwide over the Internet.

Of equally vital interest to developing countries is the impetus that OSS internet software is giving to local content creation. Rather than serving as an instrument of cultural colonialism, as many fear the Internet might become, OSS increases the ability of developing countries to use this tool to strengthen and disseminate their own cultures and world views.

The cost of providing Internet services is greatly reduced by the availability of open source software. Although "free software" does not necessarily mean *no cost* software, as noted above, much open source software is available at very low cost, as is the Linux operating system itself, or can be downloaded from the Internet free of charge. It is not surprising, therefore, that the most wide-

Table 1—SOFTWARE IN USE AT INTERNET SITES WORLDWIDE

Internet Server Software	No. of Sites (June 2001)	% of Total Market
Apache	18,069,603	63.02
MS Internet Information Server	5,972,321	20.38
Netscape—Enterprise	1,768,673	6.13

ly used software in the world for hosting Internet sites is the open source Apache server. The Netcraft Web Server Survey (www.netcraft.com) maintains and publishes figures on this.

In terms of *computers in use* as web servers, as compared to the *number of sites* shown above, the figures are of course somewhat different. Of all the computers in use as web servers, 49.2 per cent are running a Microsoft operating system, compared to 28.5 per cent running Linux, and 16.3 per cent running other varieties of UNIX.

More than any of the other attractions of open source software, it is the availability of a powerful and stable, free Internet server that has led to the rapid proliferation and increasing popularity of Linux and OSS worldwide.

Developing country initiatives

One of more interesting aspects of the open software movement is the role that governments in developing countries are beginning to play.

- China has a policy commitment to using Linux across all government departments, according to a report in the IDG (International Data Group) News Service. The report covered a statement made by China's Minister of Information Industry, Wu Jichuan, at the LinuxWorld Asia conference in Hong Kong in January 2000. China's rumored ban on the use of Microsoft Windows 2000, reported previously in the media, was not confirmed and appears to have no substance whatsoever.
- In Argentina, in April 2001, the Congress was considering a draft law calling for migration to open (free) software by government departments and decentralized organizations and corporations where the State is a majority shareholder, according to a posting on the slashdot.org website.
- Mexico has been one of the pioneers in embracing the use of open source software:
  - In 1998 the government

announced a five-year programme to install the free Linux operating system in 140,000 elementary and middle school computer laboratories throughout the country at a rate of 25,000-30,000 per year, as reported in WiredNews (wirednews.com) on 6 November 1998. Mexico's *Red Escolar* (Scholar Net) program is providing students with access to the Web and email, as well as word processors, spreadsheets and the Gnome graphical interface for Linux (one of whose leading developers is a Mexican). RedHat, developer and distributor of the most widely used commercial Linux version, is providing technical services. Despite some growing pains during about 18 months of work, the project has made an impressive start. It had 2,000 of the centers up and running as of July 2000, with an average of 7 computers at each installation and a maximum of 27 at one site.

- As of March 2001, the Federal Government anticipated that all of its database systems would be migrated to Linux over a period of one to two years. In the meantime, it was already replacing high-cost propriety software with OSS and Linux on the desktops of all administration staff. This information came from the Technical Coordinator of the capital (Federal District) administration in Mexico, reported on the reforma.com web site.
- In Venezuela, one of the largest banks, Banco Mercantile, reached agreement in May 2001 with IBM to migrate the functions carried out on 30 Windows NT servers to an IBM S/390 G6 mainframe running Linux. In the next phase, bank functions now performed on Sun Microsystems and Hewlett Packard servers running UNIX will also be transferred to mainframes running Linux. This was reported in the online infoworld.com News on 3 May 2001.
- In Brazil, the use of Linux and open source software is developing apace. Ironically, the vigorous pressing of charges of software piracy by Microsoft and other American corporations in Brazil and other more advanced developing countries (e.g. Argentina, China and Mexico, among others) is fueling the flight to Linux and open source. This has led a number of countries, including Brazil, to adopt laws carrying stiff penalties for illegal copying and use of proprietary software. As a result, not only individuals and companies but also government departments are beginning to see open source software as their salvation. It is perhaps not altogether surprising that the

Brazilian online publication IDG Now (idgnow.terra.com.br) recently published a prediction that 33 per cent of computers used in Latin America would be running Linux by 2003.

BENEFITS

At times the discussion of open source software almost takes on the air of a religious debate, with the proponents of one point of view or the other adopting the rhetoric and mien of warriors in a crusade. To arrive at a meaningful conclusion about OSS and its relevancy and appropriateness for development cooperation, a clear understanding of the benefits and drawbacks is required.

"Openness" is one of the great benefits cited for open software. Here "open" (or "free", which is used nearly interchangeably) means quite simply that the software comes with its source code and with a license giving developers the right to make modifications. Note that OSS is *not* in the public domain, in which case anyone could do anything they wanted to with it. Open software licenses can exercise any level of control, particularly the stipulation that new or modified software based on open software must itself be distributed with the modified source code or with clear access to it, as well as a license providing the same level of openness as the original. The latter stipulation is the key to keeping open source software genuinely open. Otherwise, it would be possible for a developer (or more likely a large software company) to create products based on the work of others who write open source software and then add licensing restrictions that go beyond those of the original work, effectively closing off the code from future nonproprietary use, even by the original authors!

Improved software and quicker debugging and improvement. One of the great advantages cited for such software is that debugging and design improvements can, and often do, occur very rapidly as the community of developers working with the software pool their talents and experience to create better products. From the standpoint of developing countries, this openness frees them of restrictive licenses that would otherwise prohibit the creation of local language versions, or "porting" of the software to different hardware platforms, or otherwise adapting it to national and local needs.

The web site of the GNU project of the Free Software Foundation (www.fsf.org) publishes descriptions from users of innovative software solutions they created to meet specific needs in fields as diverse as automotive design, space engineering and cancer research. The examples provided were all in the United States, but the same kinds of creative solutions, some of which would not have occurred without the existence of OSS and the free collaborative problem solving it facilitates, can now be seen occurring throughout the world.

Low cost. One of the great attrac-

tions of open source software, particularly for developing countries, is that much of it is free. Sometimes there is a charge, e.g. to cover the cost of providing the software on a distribution medium such as CD-ROM, together with printed documentation. Very often that cost is quite modest compared to most commercially available software.

The endless cycle of high-priced upgrades of commercial software is well known. This type of consumerism is well beyond the financial capacity of many developing country citizens or governments and poses a serious constraint on their development. Open software potentially offers a way to break out of this pernicious cycle while still ensuring that the software will undergo continuous development and improvement.

Mexico's Scholar Net project, mentioned above, estimates it would have cost at least US$ 885 to install Windows 98, Microsoft Office and a server running Windows NT in each school computer laboratory, which works out to about $124 million for 140,000 laboratories for software alone. By comparison, it costs US$ 50 to purchase a single set of installation CDs and a manual for RedHat Linux which can be duplicated and reinstalled without limits under the terms of the open software license. (The cost of Redhat's technical services to assist in setting up the system must be added to this figure). Clearly, a project of this nature and magnitude would be inconceivable without open source software.

The hardware requirements to operate Linux are less demanding than those for the current versions of Microsoft Windows. It is nevertheless true that, when setting up computer systems where none exist, acquisition of even the minimally acceptable standard of hardware usually requires a considerable capital outlay, whether the choice of environment is open source or a commercial operating system and software. Many computer manufacturers deliver their hardware with a pre-installed operating system (i.e. some version of Microsoft Windows). Increasingly it is possible to obtain hardware, especially servers but also desktop and notebook systems, with Linux as a pre-installed option at comparable or more attractive prices.

The search for innovative solutions to the problem of expensive hardware is currently ongoing in at least two developing countries and may eventually be fruitful. One such initiative to design alternative "open hardware" that runs Linux is the "Simputer" under development in India. This handheld device has the form factor and some characteristics of the Palm and similar handheld devices produced by other manufacturers in recent years. The goal of the group developing the Simputer is to market it for Rs9,000 (about US$ 200).

A somewhat more ambitious project is the "Volkscomputer," a Brazilian-designed desktop computer currently under development. Its target price of 600 reals (about US$ 300) would cover

the computer, a small monitor, keyboard, mouse and modem and, of course, the Linux operating system and web browsing software, but no disk drives. The initial target audience for this essentially web browsing unit consists of public schools and low wage earners.

Improved security. A number of countries, including China, have indicated that Linux and open source software are a good choice for them in order to maintain local control of the operating system and improved security. It is estimated that very few programmers in China are familiar with Windows source code, while numerous developers have access to open code for Linux and applications written for the Linux operating system, enabling them to develop their own versions and applications.

The concern with security is misplaced. Many of the security flaws discovered recently in software, particularly email servers and clients, web browsers, messaging systems, etc., were found in the ubiquitous Microsoft Windows products.

Reduced dependency and enhanced self-reliance. Self-reliance is at once the most pervasive and most elusive goal of international development. As the examples above show, some time ago a number of developing countries embarked on the road to reduced dependency on the major software producers by embracing Linux and the open source movement.

A related aspect is that OSS enhances the capability of developing countries to develop their own local web sites and content that asserts their local cultural identity. Frequently, discussions about Internet services in developing countries center around frustration at the lack of reasonably priced high-speed access to web sites around the world. This ignores the fact that, at this juncture, it may be more productive and more interesting for many developing countries to have Internet services within their own national borders. These Internet services will still bring many benefits to the population, and will certainly be cheaper to create since high speed (high bandwidth) telecommunications will be less of a concern. The Sustainable Development Networking Programme (SNDP), supported by the United Nations Development Programme (UNDP), points to one promising approach: this is to identify in areas around the country those users (or potential users) who have money and are prepared to pay in order to receive the benefits of connectivity, and then to build from these nodes. In most instances, these will be business concerns, initially.

Defusing the copyright and intellectual property infringement issues. A number of developing countries face serious handicaps in their diplomatic and trade relations with some industrialized countries over issues of copyright and intellectual property infringement, particularly in the area of computer software. It is not surprising that there are thriving pirated software markets throughout the world. Acquiring and constantly updating most commercial

software involves excessively high costs. Instead, it is relatively easy to copy computer software and package it for sale. And it is impossible for most, if not all, governments to control this traffic.

Open source software now offers a means for developing countries to emerge from the shadow of software piracy. Apart from custom scientific and engineering software, a variety of personal productivity or desktop software is now available for Linux systems. Some is provided free of charge with the operating system, while other software, including a full "office suite" comparable in functions to Microsoft Office, StarOffice 5.2, is available from Sun Microsystems at www.sun.com as a free download or an inexpensive CD set.[2] While ease of use of these systems suffers somewhat in comparison to today's mainstream software, this situation is changing. The Mexican school system project may perhaps point the way for others who are interested in Linux not only as a server operating system, but also as a long-term desktop alternative to high-cost proprietary operating systems and software.

SPURIOUS CHARGES

Open source software is "viral" and destructive. The open source debate, always lively, has been heating up lately. The Wall Street Journal Online issue of 18 June 2001 reported that, "The initiative [by Microsoft to vilify Linux and open source] has included speeches and statements in recent weeks by Microsoft officials, and reached a crescendo of sorts in a recent *Chicago Sun-Times* interview with Microsoft Chief Executive Steve Ballmer, in which he called Linux 'a cancer that attaches itself in an intellectual-property sense to everything it touches.' That Microsoft does not truly believe this is apparent from evidence also cited by Gomes that Microsoft itself uses (legally, to be sure) open source code drawn from the FreeBSD operating system (another operating system similar to UNIX and Linux) in a number of its products, including several versions of Microsoft Windows itself and Hotmail.

Its use leads to chaos and insecurity. A frequent critique of open source software is that it engenders chaos since, by definition, it can be modified and redistributed by any user. This, it is said, can lead to a nightmare for systems administrators. Moreover, the argument continues, data maintained in such malleable systems is necessarily insecure and subject to corruption or loss.

Proponents of open source software rebut this with numerous examples showing that the user community's freedom to modify open source software leads to rapid and continuous debugging and improvement. Chaos is not an issue because not only the GPL license but most open software licenses require those who modify an application to publish and document the changes they have introduced and to make the source code of such changes available as well. Indeed, open source software relies on a

highly organized and copiously documented *managed process* for software modification and updating, including version numbering and naming conventions. In practice it is at least as easy for users to keep track of changes and versions as it is with most proprietary software packages.

IBM, long considered a bastion of the status quo in information technology, has wholeheartedly embraced Linux and the open source movement. Itworld.com on 29 June 2001 quoted the director of Linux solutions and marketing at IBM's software group as saying that Linux's open source nature does not rule it out as a viable platform on which independent software vendors can build commercial products. "Commercially licensed software on top of open-source software", he said, "is a viable business model".

Open source fails to protect rights of authorship and ownership. The charge that open source software does not respect rights of authorship and ownership is not so much unfounded as irrelevant, since it ignores the fundamental concept of free or open software. No one disputes that the inventor of the Linux operating system core, Linus Torvalds, is the author of the software. However, the GNU/Linux operating system "belongs" to the community of users. It is based on the work of many programmers whose work is also open source and it provides the platform or operating environment for much of the open software being written today.

DRAWBACKS

Notwithstanding the above comments, there certainly are some drawbacks to adopting open source software, or perhaps they should be seen as hurdles to be overcome. It is especially necessary for decision makers in developing countries, who don't usually have the luxury of being able to afford costly mistakes, to weigh the issues most carefully.

It's not "free." This article has repeatedly emphasized that OSS is not "free". There are costs. Some of the savings accruing from the use of OSS may have to be spent in acquiring more expert and consultant services than would be the case for some Windows-based software. Since such services can be obtained anywhere in the world, however, rather than exclusively from expensive, high-profit margin software publishers, the end result is bound to be lower costs.

Linux and some open software is difficult to learn and use, particularly as "desktop" computer solutions. Undoubtedly, open software is more difficult to learn and use than Windows and Macintosh products at the present state of the art, since it has not yet benefited from a long development cycle, one of the fruits of which is ease of use. However, the Mexican authorities and the Scholar Net project are apparently not at all concerned about ease of use so it will be interesting and instructive to observe their experience as the project unfolds.

In any event, to evaluate the suitability of Linux and open source software

strictly on the basis of potential use as desktop software by end-users is to miss the point, tempting as it may be to see here a possible end to Microsoft domination and an endless cycle of expensive license purchases. The main use of Linux and open source for at least the next few years will continue to be as servers, particularly Internet servers, for which purpose they excel. Here, again, ease of use may be something to consider. The open source platform is a stable, robust one for use as Internet and other server applications. However, configuration is undoubtedly more difficult than, for example, setting up a Microsoft NT or Windows 2000 networking or Internet server for those who do not have previous experience with a UNIX style environment. Some of the savings on software may well have to be spent to acquire expert services to handle initial setup and configuration.

There is a severely limited selection of software available. It is generally believed that there is still a relative paucity of software available in the open source environment, although the supply is steadily improving, compared to the Windows environment. This perception is undoubtedly a constraint on the adoption of Linux and open source software for end-user desktop use. Obviously this is less important for enterprise (including government) solutions, which typically rely on custom software applications, mainly databases, which can almost certainly be developed less expensively and more rapidly in the open source environment.

Even for desktop use this may not really be a significant constraint. Several basic office "productivity" suites for desktop use (consisting typically of a word processor, spreadsheet, graphics/presentation package and a database) are now available as open source software. Windows users are, in practice, limited to a choice of three professional-strength suites—Microsoft Office, Corel Office and IBM-Lotus Smartsuite. Since Microsoft Office has become the unofficial standard, compatibility with which is now an absolute requirement in most offices, Linux users may not be as poorly provided for as it may seem.

The open source Internet server software packages, offering web, FTP and mail server functions are so reliable that they have become the de facto standard for Internet services throughout the world. Fast, secure, high performance, open source relational SQL (structured query language) databases are available. So is a growing selection of software enabling the creation and management of collaborative web workspaces such as Zope, instant messaging such as Jabber, enhanced data exchange via XML Blaster, and others.

There is a need for commercial software developers to create a viable and profitable business model for open software development. It is certainly true that the availability of open source software will be hampered until

more software developers become aware of the true nature of the various open source licensing schemes, of which GPL is only the most apparent, and the vast range of commercial prospects for creating a financially successful business around the open source model.

Since the industrialized countries have very few advantages over the developing countries in terms of *acquired experience* in this field, and indeed many existing entrepreneurs suffer the disadvantage of "baggage" from their prior experience, open source may become a fruitful new area of activity for developing country software businesses.

Linux is incompatible with some existing computer hardware and peripheral components for which there is still a notable lack of device drivers. The ability of Linux to make do with modest computer hardware comes at a price: Linux is still poorly endowed with *device drivers*—the small programs that provide the necessary linkage between peripheral hardware such as printers, scanners, modems, fax machines, etc. and the operating system. Without these it is either impossible to configure Linux to operate on a given computer, or it is necessary to give up critical hardware devices, which may be an unacceptable compromise. This problem is not unique with Linux. It is in fact reminiscent not only of the experience of early adopters of Microsoft Windows a few years ago, but is a hurdle that still confronts users of Windows NT and, to a lesser degree, Windows 2000 and other high-end or specialty operating systems.

OSS AND TECHNICAL COOPERATION AMONG DEVELOPING COUNTRIES

The topic addressed here has special relevance for Third World development and for technical cooperation among developing countries. Too often, information technology has been seen as a panacea for ills it could never hope to cure. This has contributed, understandably but unfortunately, to an all too common predisposition to label information technology as an inappropriate and unnecessary luxury where pressing human and developmental concerns such as poverty, hunger, AIDs and other diseases, environmental degradation and social injustice need to be urgently addressed.

The suggestion has been made that the "digital divide" is a non-issue and that the proper focus is the overall economic gap that separates the haves from the have-nots. Some argue that the rush to fund IT projects and create Internet connectivity throughout the developing world (and even for underprivileged people within industrialized countries) is misplaced, and that the effort would be better directed at other areas of development. This case is made most eloquently, and on the basis of deep personal experience, by Wayne Marshall in his article "Algorithms in Africa", in the *Linux Journal* (June 2001). At the same time, Marshall concludes with a positive finding about the relevance and impor-

tance of IT and the open source movement to development activities. Yet those merely seeking support for a policy of benign neglect—an excuse to do nothing about spreading computer literacy, information technology and Internet access to the less economically successful countries and segments of society—may well choose to ignore this overall thrust of Marshall's argument. This article is highly recommended to anyone deeply interested and involved in policy and programme funding issues relating to IT not only in Africa but also throughout the developing world.

Increasingly, developing countries are raising an alarm about the negative impact of the emerging global Internet on their development prospects. The Sustainable Development Networking Programme (SNDP), supported by the United Nations Development Programme (UNDP), has noted that more and more developing countries are expressing concerns about the new competition their local firms are facing from e-commerce servers and services in industrialized nations. A few firms are conquering the new markets in the global marketplace, leaving little for those who lag behind in information technology. Viewed in this light, development projects aimed at trade development and export promotion would seem to miss the boat if they fail to take into account the rapidly developing electronic marketplace. This is not intended to suggest that every developing country needs to have companies operating electronic malls on the internet. It is noteworthy that a South African Internet consultant conducted a recent study of African Internet access and concluded that only 15 out of 51 countries are capable of transmitting data overseas at the modest broadband rate of 1 megabit per second data speed common for small businesses in the developed world. It seems evident that acquisition of rapid, low-cost communications between suppliers and clients such as the Internet provides can profoundly affect the prospects for the success or failure of economic growth in Third World countries depending on trade and commercial development.

The digital divide exists, and it is growing. It exists between nations, separating the rich from the poor, and it exists within nations, separating the rich from the poor and the urban from the rural. As in so many of our human concerns, the truth about the role of IT in development lies somewhere in the middle: information technology cannot by itself cure any of these problems, yet increasingly it is to be feared that the solution of these problems will elude us unless we make intelligent, productive use of IT.[3]

A wise development worker once observed that in any given situation the people concerned are the real "experts" on their own condition. Proving this adage, a growing number of developing countries mentioned above have recognized that the vast strides forward in IT crucial to their development will not be possible as long as they rely primarily on expensive

technology imported from the advanced countries. Thus steps are underway to explore and, already in a few cases to embrace, the use of open source software.

Technical cooperation among developing countries has a potentially vital role to play in this area. More people in developing countries *outside the technology establishment* need to be made aware of the open source movement and what it can contribute to their development needs. Wayne Marshall's article in the *Linux Journal* cited above makes a persuasive case for "small is beautiful" in project activities to expand the benefits of open source. The United Nations Volunteers and the Korean Youth Volunteer Corps have both created projects specifically to recruit and field volunteers for assignments to teach skills in using computers and the Internet.

A useful project at this stage would be the creation of a clearing house for the exchange of information and acquired experience with the open source alternative. The particular advantage of such a clearing house would be its aim at a wider target audience of nontechnical users and policymakers. The latter are not likely, in the normal course of events, to encounter the wealth of information available from specialist web sites and publications targeted to Linux and open source programmers, users and enthusiasts which, in any event, are less accessible and less oriented to the interests and needs of generalists and policymakers.

Technical cooperation among developing countries can play a pivotal role in increasing understanding and generating more interest in IT development based on the use of open source software. A 1998 book from MIT Press highlights a number of areas for exploration:[4] (1) ways to enable low-income people to become active producers rather than passive users of the new information technologies (e.g. as content providers); (2) use of the new technologies to provide a better dialogue between public agencies and villages and low-income neighborhoods; (3) helping low-income youth to become entrepreneurial users of the new technologies; (4) new initiatives that exploit better the educational capabilities of the computer; (5) promotion of the concept of the community computer and making use of applications of computer and communications technology that foster community development.

Projects in all these areas are possible using proprietary mainstream hardware and software, or would be if costs were of no concern, which unfortunately is not the case. This article has attempted to show that there are numerous advantages to exploring the open source alternative. Not the least of them are low costs and thus better doability and sustainability. There are also the benefits of better software and more creative approaches to getting the development job done, as a result of the increased sharing of experiences, ideas, successes and failures throughout the developing community. Underlying the open source

ethos, at a level more basic than the bits and bytes of computer programmes, is the concept that all human beings can benefit from openness, sharing and the free exchange of ideas in a larger community of learners and doers. ■

Notes

[1] Apple Computer's recently released desktop and server operating system OS X ("ten", not "x") is a UNIX-derived system based on open source components. Apple describes itself as the first major computer manufacturer to make a commitment to an open source operating system. Source code for the operating system core called "Darwin" is made freely available by Apple, as are a number of other software products available under Apple's version of the open software license (see www.apple.com/darwin/). Apple OS X on the desktop is a polished, stable system and the server edition provides the usual range of file, application and web server capabilities. It is worthy of mention that Apple bundles and distributes the OSS Apache web server with OS X. The effectiveness of the OS X server version and its components, as compared to Linux and OSS written for that platform, cannot yet be evaluated, although these essentially commercial products are certainly more expensive.

[2] Readers wanting to test the open source waters without taking the plunge and installing Linux can obtain a free MS Windows version of StarOffice 5.2 at www.sun.com. Apache Internet Server and Zope are two other open source packages referred to in this article that, among others, are available for multiple platforms, including Microsoft Windows.

[3] For a solid assessment of this topic see *Creating a Development Dynamic: Final Report of the Digital Opportunity Initiative* (July 2001, Accenture, Markle Foundation and UNDP).

[4] *High Technology and Low-Income Communities: Prospects for the Positive Use of Advanced Information Technology* (1998, MIT press, Donald A. Schon, Bish Sanyal, and William J. Mitchell, editors).

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The primary sources for this article was online information obtained from a wide variety of web sites. The principal sites consulted which may be of interest to *Cooperation South* readers are cited below.

- Creating a Development Dynamic: Final Report of the Digital Opportunity Initiative: Accenture, Markle Foundation and UNDP (July 2001).
- "Algorithms in Africa" : Wayne Marshall, *Linux Journal* (June 2001).
- www.apple.com/darwin/ : Apple Computer, Inc. The link shown at the right is the open source software page. Apple is the first major computer manufacturer to commit to an open source operating system (OS X).
- www.sun.com : Sun Microsystems, a major producer of high-end computer hardware and software distributes its open source StarOffice desktop applications suite free of charge.
- www.netcraft.com : Netcraft, a site noted for its

quick web site lookup facility, also maintains copious statistics on Internet web sites, the equipment and software they are using, etc.

- www.fsf.org : The Free Software Foundation (FSF), home of the GNU project, is dedicated to promoting computer users' right to use, study, copy, modify, and redistribute computer programs.
- www.opensource.org : Open Source Initiative (OSI) is a non-profit corporation dedicated to managing and promoting the open source definition.
- www.wired.com : Wired Digital offers a range of dynamic online products for people using emerging technologies personally and professionally, including technology-oriented news and information.
- reforma.com : A Spanish language online news service in Mexico.
- infoworld.com : InfoWorld provides in-depth technical analysis of issues and reports breaking news, trends and information on key products and solutions in information technology.
- idgnow.terra.com.br : A Portuguese language site in Brazil offering a variety of information products and services.
- Itworld.com : ITworld.com is an online publisher of educational content for the IT community, offering a wide range of daily-breaking IT news, 37 topic-specific newsletters, IT white papers, and a variety of broadband programming.
- slashdot.org : Slashdot.org styles itself as "News for Nerds". It is owned by the Open Source Developer Network (OSDN).

"Electronic Democracy"

BUENOS AIRES AND MONTEVIDEO

by SUSANA FINQUELIEVICH

Electronic democracy and electronic governance are new buzzwords, coined to describe the increasing use of communication technologies for improved internal management, citizen communication and popular participation in governments. Such initiatives have recently been taking place in Buenos Aires and Montevideo, involving both similarities and differences and achieving mixed results. A binational team has now done comparative research on these experiences, directed by Dr. Susana Finquelievich of the Gino Germani Research Institute, Faculty of Social Sciences, University of Buenos Aires.[1]

MANY CITIES ARE BEING TRANSFORMED into communication hubs using communications technologies. And many municipal governments are converting themselves into information networks that facilitate administration, communication and interaction with other levels of government and with citizens. In some places, these changes are accompanied by attempts by civil society organizations (CSOs) and regional and national authorities to adopt various versions of "electronic governance."

"Electronic democracy" as a means of improving the responsiveness and reliability of political institutions has attracted the interest of academics, politicians and activists since the 1960s. In that era, some activists who believed in the democratic potential of the new technologies turned to a wide variety of communications media (such as free or

pirate radios). Since then, various experiments with remote access to information, teleconferencing technology and interactive cable television have provoked frequent debates on the advantages and risks of these technologies to social and political processes (Tsagarousianou, 1998).

Many of the experiments in electronic democracy, including those examined in this study, share a number of characteristics:

- They are perceived by the social actors who initiate or participate in them as a means of revitalizing democratic policies that, for a variety of reasons, have weakened and lost their impetus and vigor.
- They are seen as a means of streamlining the bureaucracy, enhancing the transparency of government and achieving consensus among citizens.
- They are local or regional in character and associated with urban or metropolitan territories, even though they may also comprise elements of the national strategy;
- They are based on similar technological infrastructures, even though they may differ in their forms of organization.

The cities of Buenos Aires and Montevideo were selected for a comparative case study, since their geographic proximity and cultural similarities clearly highlight the differences and similarities in the urban and social uses of these technologies.

The objective is to evaluate the impact of the integration and use of information and communication technologies (ICT) in local government and in communication with citizens, as well as in the practices of CSOs seeking to be interlocutors with governments. The research team investigated the use and effective scope of ICT in the internal government administration and in local initiatives to bring the population into the information age. It analysed the use and scope of ICT in communication between local governments and civil society and in community organizations. Both primary and secondary data were collected and processed, including electronic surveys, face-to-face and electronic interviews with municipal authorities, reviews of the development of municipal web pages, study of the cities' projects to promote the integration of ICT, and monitoring of trends in the use of ICT by community-based organizations.

ICT IN LOCAL GOVERNMENT

Experiments in electronic government began in the second half of the 1990s. In Europe, the Telecities Project was launched and funded by the European Community to enable local governments to pool their resources and experiences in the use of ICT for urban administration. In the United States, examples of electronic government became more frequent, not only to facilitate local management, but also in an attempt to overcome the "democratic deficit"—the

lack of interest and involvement of citizens in public affairs.

The objective is not only to open web portals or websites containing data on the State and to facilitate internal management processes. Electronic government means placing the State, at the national, regional or local levels, on the Internet to help bring about a change in the political and institutional culture and to enable citizens to access information that is of interest to them. For these sites and tools to be genuinely viable, the first requirement is a technical one—to ensure that data entered would be secure en route through cyberspace. Then there are several broader social requirements—to ensure that all citizens have the necessary training to navigate on the Internet; to allow them to have access to information tools, whether in their homes or through Internet centres or other public facilities; and to ensure that there is adequate communication with an increasingly important group of social actors, namely, citizens' networks.

Electronic government is not about putting data on websites, but about changing the political and institutional structure so citizens can access needed information.

The various policies adopted by national and local governments on the use of ICT are expressly or secondarily intended to address problems of governance, either directly or indirectly. Information and communication technologies are key elements of a government's decentralization policies. It is assumed that their use would enhance efficiency and transparency in government administration and communication with citizens, by promoting greater accountability, transparency, predictability, integrity, etc. Consequently, municipal governments in their political actions must seek alternative approaches to the traditional models of public administration. This search comes up against a number of difficulties, including the identification and/or improvement of vehicles for participation and consensus and the modernization of management technology.

Buenos Aires

An excellent case study is the city of Buenos Aires, which began a process of greater local autonomy in urban management in 1996. Under the provisions of the City Charter, the post of Head of Government was created, and a Decentralization and Modernization Program was initiated. As part of that, Management and Participation Centres were established as territorial units of political and administrative management (known in Spanish as CGPs: Centros de Gestión y Participatión). Among the most important goals of the decentralization is "to permit citizens greater access to and participation in government decisions

through the use of information and telephone networks". This opened a new field for the implementation of ICT.

The programme provided for computerizing the CGPs by 1998, establishing a communications network (Intranet), developing a system for receiving complaints using Internet-compatible technologies, providing training in the use of information resources and selecting a staff to operate the information system in the Centres. These objectives have only been partially met, are only now beginning to be implemented or have still not been implemented. The Intranet has still not yet been installed. The complaint system was streamlined. The CGPs have been computerized but their operation is uneven. In some cases, technological problems have arisen and in most cases not enough use is being made of available equipment. Nevertheless, processing of

Information and communication technologies are key elements of a government's decentralization policies.

the citizens demands for the resolution of problems of infrastructure and services improved markedly with the use of the Internet, which in turn had a positive impact on the flexibility and rapidity of the system.

Communication and connections between the Executive and the decentralized units are very precarious. Internal communication in the organization using ICT is practically nonexistent, as is participation in Buenos Aires municipal government site. It has been openly stated that decisions are taken "top down" without the participation of the CGPs. The result has been the underutilization of installed capacity and a lack of training and adequate support systems. If no changes are made to these management structures, it will be difficult to achieve the organizational changes needed to optimize the use of the new technologies.

Computerization of the legislature

The Legislature of the Autonomous City of Buenos Aires was established on 10 December 1997, ushering in the political autonomy of the City. One of the innovations in the Legislature is the installation of a modern information system that controls the operation of services in the Legislative Building, transforming it into a "smart building". In addition, the building was computerized and an internal network established for the Legislature.

The Intranet has come up against obstacles and delays. One of the principal obstacles is the lack of trained personnel. Another is the excessive time that available personnel spend on help desk tasks. Management has a staff of 25 employees, most of whom provide maintenance and technical support for the 600 terminals in the network. Few staff members are available to design and develop new applications. The persistence of anachronistic

practices and closed channels of information presents another obstacle. This situation is made worse by the ignorance of many legislators and officials of what an Intranet is, and by the rapid growth of the Internet website, which is used as an information input in place of the inadequate Intranet service. Management of content is the exclusive responsibility of the Press Department. This means that the Intranet function is merely informational and not interactive.

From a management standpoint, there have been four main consequences in the Legislature.

First: the emergence of resistance and conflicts, since the introduction of technologies has not been accompanied by a comprehensive process of institutional modernization covering all areas of government.

Second: the promotion of greater involvement and new types of cooperation and organization that result in greater efficiency in the discharge of institutional responsibilities.

Third: greater availability of information, both to officials of the institution and to a portion of the citizenry.

Fourth, a negative consequence: it may serve to deepen even more the crisis of lack of faith and apathy and pose more of an obstacle than an incentive to citizen participation. The problem lies in the delay in making available instruments to promote effective civil participation. Tools that do not exist are promised (live transmissions, forums, chat rooms) and other tools (public hearing applications, Strategic Plan, linkages with the Government Decentralization Program, etc.), but then are overlooked and not developed.

GCBA Technology 2000 Centres Program

A small group of government officials in the city of Buenos Aires took the initiative to provide free Internet access for citizens through computer terminals in public areas. These "Technology 2000 Centres" operate in Management and Participation Centres (CGPs) and public libraries in different districts of the City. They serve a diverse population in terms of social and economic level, integration in the district, age, sex, motivation and interest and ICT training. The Centres that operate out of libraries have three PCs, while those located in the CGPs have between 14 and 18 computers. Use is for a limited period. While no training is provided, users are assisted by the Centres' technical staff in how to navigate the Internet and use electronic mail. There are no printers for public use, nor are diskettes allowed for fear of computer viruses. The numbers of those using the service during the day is very high, varying between 25 and 120 persons per day, depending on the equipment available.

Information has been compiled and statistics gathered on the use of the Technology 2000 Centres. These data show that many habitual users are children and young students with a certain mastery of the Internet. In terms of the services most

frequently used, younger users chat while adults use the e-mail services. The users typically lack access to the Internet in their homes or places of study and work, and the Centre represents the ideal "place" for connecting to the Net. The programme has successfully accomplished its objective by attracting a large number of users and providing free Internet access, especially for children and young people who otherwise would have no access. However, it does not promote training, does not permit user participation in the project, and does not facilitate interaction between the community and local government. The programme has not been conceived in a way that takes account of the local social and cultural environment. The context is rigid; the physical environment, in most cases, is not supportive; there is no linkage between the activities of the host institution and the Centre; and the activity begins and ends with a turn at the computer terminal.

What differentiates a Technology 2000 Centre from a private computer information centre is that the former is free. However, merely facilitating access to the information society by disadvantaged sectors of the population is not enough to makes the Centres a social project. Experiences with Internet centres in other countries all show that a *centre becomes a social project when placed within a district and when it represents a place that members of the community feel is their own, with active participation in activities and management and with the possibility of encouraging local promoters to help make them more self-sustaining.*

Is there electronic governance in Buenos Aires?

The political and legal changes in the GCBA suggest a trend towards the opening of new spaces for participation through the use of ICT. But in order for forms of community participation in city management to develop in this public space, real or virtual, there are additional requirements.

On the government side, there must be computer equipment in the various branches of government. Meaningful change in the institutional and political culture is needed to ensure openness and transparency in information flows and enhanced community participation in local administration. Making information available to the population through ICT requires, first and foremost, that the managers themselves, beginning with the

Government managers must learn computer skills, change their perceptions about the use and potential of ICT tools, and ensure openness and transparency in information flows as well as enhanced community participation in local administration.

Executive, should learn computer skills and change their perceptions about the use and potential of these tools.

On the side of the public, people also need to develop familiarity with computer equipment and to change their perception of the use and potential of these tools through computer training campaigns.

The attempt at electronic governance has serious limitations at the level of the actors involved. Politicians and government personnel do not favour use of ICT. They use the portal as a means of institutional dissemination, limiting the web page to an electronic bulletin. They fail to encourage citizen interaction, and citizens are offered no alternative channels of communication such as chat rooms or talk forums. In addition, the level of ICT use by citizens for interaction with government and civic participation is low. There is no link between explicit policies and government statements about "modernization" through use of the Internet on the one hand, and the initiatives of the governing class to interact more closely with citizens through new forms of participation on the other hand.

Montevideo

The Municipal Intendency of Montevideo (IMM is its acronym in Spanish) governs the smallest and most populated Department (1,344,839 inhabitants) of the Eastern Republic of Uruguay. Since 1990, through three consecutive elections, the Department has been governed by the leftist coalition "Frente Amplio", which has promoted medium-term political and organizational reform projects that have had the support of citizens. One of the changes in municipal government was introduction of a decentralization policy. The process began in 1990, but it was only in December 1993 that local political organs and Neighbourhood Councils were established as organs of social participation. The following organs function in each of the Department's 18 districts:

- a local board—for programming, management and control of public works and planning in the district;
- a Neighbourhood Council—the body responsible for identifying needs and priorities and for ensuring participatory monitoring of plans; and
- a District Community Centre (CCZ)—a municipal service to promote decentralization of the administration and services.

The process of computerization of the Municipal Intendency of Montevideo began in the late 1970s with the introduction of mainframe computers for the registration and printing of invoices in real time. In 1990, consideration was given to introducing a computerized management system that would integrate various departments and functions. The Central Computer Service of the Universidad de la República was asked to develop a strategy for the computerization of the municipal government.

In 1992, installation work began. Under this plan, no linkage was made

between the innovations being introduced and projects involving citizen participation. The computerization process was carried out simultaneously with the decentralization plan, which involved the establishment of the District Community Centres. However, it did not include any linkages to the participatory experience that is implicit in the use of ICT. The use envisaged for ICT in the CCZ was related to the administration of the Intendency; it was not a vehicle for communication with citizens.

One of the major problems inherent in the newly installed computer system was the degree of training required by operators of the system. The different rates of introduction and use of the various computer tools by the various departments and divisions were due to the different capacities of the officials concerned. Age is a key determinant of how quickly new technologies are introduced: younger officials adapt to and manage the system more rapidly, while older officials appear to be more resistant to the new procedures. Lack of training leads to errors in data entry and contradictions within the system itself. Although the quality and operation of the systems installed were judged to be positive, the lack of training of a large group of municipal workers is an obstacle to their optimal functioning.

In this process, the CCZ became "municipal offices closest to the people." The existence of an integrated computerized system enabled some procedures to be completed at the CCZ. However, in order to initiate most of the procedures, it is necessary to go to a central government office. Procedures cannot be initiated on line.

Opinions are divided as regards the impact of ICT on the level of civic participation. There is the fear, mentioned openly in interviews, that this medium might replace the traditional medium of face-to-face participation, which is considered essential for the restoration of community spaces. This is consistent with the policies of decentralization pursued by the municipal government over the last 10 years and with the nature of the information contained in the Web page devoted to this type of activity. This vision is also consistent with the perception of ICT as a relatively inexpensive means of promoting the city's attributes abroad, including its tourism and investment potential, rather than as a tool for promoting greater interaction. Both the national and municipal governments in Montevideo have similar perceptions about the potential of these technologies.

The potential for the use of ICT lies in the high number (26 per cent[2]) of households in Montevideo that have computers and Internet connections, which could provide a material base for promoting participation through ICT. While this percentage applies to households with a higher level of education and income, it nevertheless represents a significant portion of the city's population. This total does not include public facilities offering access to these technologies.

E-government in Montevideo

As was the case nearly a decade later in Buenos Aires, the computerization of the IMM was carried out simultaneously with the decentralization plan, although the programmes were not connected to each other and did not share a common objective. Computerization was carried out for the internal management of the IMM itself. It was not conceived as a means of communication with citizens, nor did it include linkages with initiatives to promote participation through ICT. The use envisaged for ICT in the CCZ is related to municipal administration, not as a tool of communication with citizens.

A conjunction of circumstances favored this plan. The national government had favorable attitudes and strategies regarding the use of ICT as a means of economic and social promotion. And a high number of households were equipped with computers and Internet connections. Nevertheless, the impact of ICT on urban management in Montevideo still leaves something to be desired. Municipal officials are still not completely aware of the possibilities of ICT as a vehicle for interaction with citizens. They perceive ICT as a relatively inexpensive means of promoting the city's attributes abroad rather than as a means of communication with citizens.

The installation of the IMM computerized system in the IMM paralleled the creation of the CCZ as decentralized administrative and political bodies. However, these two processes are not convergent. Introduction of the computerized system is aimed at streamlining municipal management, although it does not provide for the completion of procedures on line. This parallelism without contact shows the absence, or at least the limited degree, of prospective or social impact studies of ICT on governance prior to implementation. This is probably due to the early stage (compared with other countries in the region) at which the IMM decided to computerize its administrative systems.

ICT IN CITIZEN NETWORKS

The Spanish Association of Citizen Networks (www.aerc.net) defines a citizen network as follows:

> *"A Citizen Network is a system of intervention, instrumentalization, articulation and promotion of all aspects of local development....On the other hand, public authorities have in Citizen Networks a means of reaching the most remote households with information concerning matters of common interest and a means of providing services to citizens. In the future, many procedures and processes will be undertaken by remote means. Communication between the administration and the people must become more technical at the same pace as the society becomes more technological and not lag behind....The networks can serve to increase the quantity and quality of public services, especially for those groups that have*

problems in utilizing them in their current formats. The various social groups and movements have in the networks a means of communication and coordination, a forum from which to publicize their ideas and proposals to citizens and a tool to interact with groups that have similar interests in other parts of the world".

Although this is merely the outline of a principle, it is also the building block of the city of knowledge, which requires a specific design that encompasses popular neighbourhoods, universities, social activists and organizations which, in one way or another, determine the shape of the information society.

Argentina: use of ICT by civil society organizations

The city of Buenos Aires has the highest concentration of NGOs in the country—46 per cent of the total in 2000. The National Centre of Community Organizations (CENOC), the official body that has the most complete database of community organization in the country, estimates that there are 483 organizations based in the City[3]. Half of these participate in networks and most of them are engaged in activities of broad territorial scope (44 per cent at the national level).

In our study, we have included non-profit civilian organizations that depend institutionally neither on the State nor on the market. They advocate instead new forms of collective action outside of the political party and use ICT in their activities. A self-administered survey was conducted and disseminated by E-mail. The survey mainly covered medium-sized and large support organizations in Buenos Aires that have been Internet users for at least three years.[4] We identified 78 of these NGOs in 30 days.

The most obvious finding from the survey concerns the infrastructure which has been installed. One-third of all organizations have Internet connections. There is an average of five computers per organization, of which four are connected to the network. Most of the organizations have personnel assigned to Internet-related tasks—between two and five staff in most cases. Existing staff rather than new recruits undertook this work in 47 of the 78 NGOs. In more than half the organizations responding (51.2 per cent), most staff members were self-taught in the use of ICT; a minority of them have operational and/or technical staff who are information science specialists (17.1 per cent).

Most NGOs have been Internet users for three or more years (50 cases). Half their members have access to electronic mail (47 per cent), and more than one-third of them have access to the Web (38 per cent of cases). Electronic mail and the Web are the services most widely used by organizations (42.8 per cent and 25 per cent of replies, respectively), followed by chat rooms (18.9 per cent).

Internet use enhanced access to information (20.7 per cent of replies), the publicizing of activities (20.5 per cent) and communication with other organizations

(19.3 per cent). It also streamlined administrative tasks (15.1 per cent). Most organizations use the Internet to disseminate information through their Websites (60 cases). This trend is growing among organizations with more experience in the use of the network. There is also a trend towards the development of Websites in organizations with programmes that have broad geographic reach.

The use of ICT in community-based organizations led to changes in communication and information, in the generation of new services and in the internal organization of NGOs. In terms of linkages with other organizations, most NGOs belong to a network (64 cases). The study shows that the organizations with the most linkages to other organizations at the national and international levels use Websites.

In terms of their relations with local governments, most organizations have no links with their municipalities (27.4 per cent of replies). A number of organizations participate in the activities of the municipality, such as attendance at meetings (19.7 per cent) and receiving support for their activities (17.9 per cent), while others gain access to municipal information through the Internet (14.5 per cent). Traditional linkages are still used: ICT is still not viewed as a vehicle for linkage with the government.

Through the Internet, organizations have achieved greater access to information and databases and greater participation in virtual community networks. They have also positioned themselves as producers of information. This is not limited to the use of Websites as "bulletin boards": organizations see the potential of the Internet for promoting access to resources and the creation of new services. The Websites examined use ICT to improve access to scarce resources by making it easier to obtain grants, collect funds by electronic means, promote volunteer drive campaigns, provide distance training and give access to information. The creation of services in turn relies on ICT support for receiving complaints, providing advisory services, training, E-mail campaigns, improving communication with beneficiary populations, and access to information through portals. A greater shift by NGOs towards Internet use and the integration of ICT into their functions and strategies is anticipated. It should not be forgotten, however, that in most cases these are large and medium-sized organizations with international activities. Most of the small organizations in the community are not in the same situation.

Uruguay: community electronic networks

Civil society organizations (CSOs) have played a key role in the process of Internet dissemination in Uruguay. In late 1985, during the first phases of the restoration of democracy, there was a need to maintain and consolidate social and academic networks. The alternative of ICT was explored and carefully examined, mainly by economic and social research NGOs and by scientists in the

fields of basic science and technology. Given the high technology level of the principal NGOs in Uruguay, news of the availability of ICT spread rapidly. Requests were received for sending and receiving E-mails through Chasque, the collective post box of the NGOs. In 1989, about a dozen NGOs requested and obtained from the Dutch Organization for Development Co-operation (Novib) a donation of US$10,000 to establish the first service provider for citizens of Uruguay. It was given the name of the old post office box: Chasque.

Computer and Internet access

The process of bringing information sciences and Internet to the masses led to a change in the profile of users and providers of service and content. Twenty-six per cent of the population has a PC in the home and a further 13 per cent at their place of work. Twenty per cent of the urban population said that they were frequent users of computers and 10 per cent are connected to the Internet, the highest percentage of Latin America.[5] The rate of increase in the number of Web users is 40 per cent annually. Analysts estimate that the saturation point will be reached in 2003 with a 25 per cent coverage.[6] Also increasing are ICT based services: 54,065 hosts with the extension ". uy" (abbreviation for Uruguay) were identified in the Internet software consortium survey of January 2001, which placed Uruguay number 47 in the world under this ranking system.[7]

The distribution of access to ICT was measured by analyzing PC ownership according to socioeconomic level, showing that the digital gap is a factor of income. In the upper and middle-to-upper strata, 58 per cent of the population have access to PCs in the home and 25 per cent at work, as compared with 22 per cent and 14 per cent, respectively, in middle-income groups, and 2 per cent and 8 per cent in middle to lower middle class groups.

Internet access is 10 per cent. There is, within this 10 per cent, there is a generational gap in a country whose average age is over 32 years. Sixty-two per cent of Internet users are under the age of 30 years and 19 per cent between the ages of 30 and 40 years. The proportion diminishes between ages 40 and 50 years to 11 per cent and declines further to 8 per cent among those older than 50 years.

The flagship economic sector of the information society in Uruguay is the software industry. It is developing into a regional benchmark for the development of information systems for companies, and has attained world-class competitive capacity. The State fulfils the role required of it by the most dynamic companies in the software sector: to generate an external image of a technological country, facilitate access to sources of financing and promote the Information Society. The clearest initiative was the establishment of the National Committee for the Information Society. Its principal national objectives and plans for the next three years include:

computer literacy, development of computer services for citizens and enterprises, modernization of public administration, promotion of an efficient telecommunications and Internet market, programme of support for competitiveness of the software sector (Polo Uruguay Soft), and a training and certification programme for the introduction of quality control processes in companies developing information and communications technologies.

This promising agenda encompasses nearly all sectors of national activity. It will require active participation by civil society with a view to guaranteeing the promotion of the public interest. Public discussion is needed of the desired objectives and the practical methods of implementation. Consequently, the role of NGOs should be central to this process.

NGO roles in community connectivity

Up to the year 2000, national policies have emphasized private, household and company connectivity. In the meantime, civic organizations have had a pioneering role in the dissemination and social ownership of ICT for community purposes. Starting in 1998, a joint NGO-government project called Bibliored[8] (meaning library network) introduced an innovative strategy of connectivity and access to a network of Internet Centres in Montevideo. These are hosted by the libraries in 20 District Community Centres in Montevideo.

On the government side, the leftist Intendency district of Montevideo provides the premises and the "atmosphere" for the Internet Centres. The NGO is the Franciscan and Environmental Research and Promotion Centre (CIPFE)[9], which is specialized in the issues of poverty and marginalization. In each centre, CIPFE installs an average of four computers and provides a computer instructor and an Internet tutor. They provide computer training at a minimum cost (US$23 monthly per pupil), fees which are used to pay teachers' salaries. Four hours of Internet access are provided free of charge each day. The project also aims to computerize the database and management of each district library.

Thus far, 1,700 students have been made computer literate, and 800 more students are currently being trained. The profiles of users range from children and adolescents to old people up to 85 years of age, many housewives, young job seekers and workers who are seeking to avoid losing their job competitiveness. In interviews with tutors, emphasis is placed on those adults who have PCs in their homes or workplaces, but do not know how to use them. Economic profiles vary depending on the district, but the project gives priority to needier districts.

It is also interesting to assess how community service NGOs themselves work with ICT in their own operations. In late 2000, we conducted a survey which collected comprehensive information on ICT uses by 60 such NGOs in Montevideo. The NGOs surveyed came

Box 1—URUGUAY: NGO TECHNOLOGY USES

	Per cent
Computer equipment	
Own equipment:	
at least one PC	87
a multimedia package	55
a printer	78
Shared use:	
with another NGO	10
member's home equipment	11
ICT use	
Began before 1994	18
Have Internet connections	60
Have own e-mail address	70
Have own Web page	25
Have an Intranet	21
Telephone	
The most used technology	93
Have only one phone line	38
Have more than 5 phone lines	14

from a random sample in the national directory of organizations, "Con fin solidario", produced by the Institute of Communication and Development (ICD) which groups NGOs formally established and working for the benefit of the community.[10] The survey instrument was a questionnaire similar to the one used in Buenos Aires. The main statistical findings are in box 1.

The survey gave some insight into the methods which these NGOs use for outreach, showing that the social NGOs are very active and generally follow a multimedia communications strategy. The technologies most widely used are the telephone (93 per cent) and the fax machine (68 per cent), in addition to the traditional postal service (73 per cent). In addition, other communication channels used include meetings and media, as shown in box 2.

As regards ICT as a tool of participation in local government, the most active NGOs have so-called "high connectivity": high frequency channels, several telephone lines and Intranets. The correlation ratio between having an Intranet and coordinating with the IMM is 0.54, that of impacting on local policies 0.35, of

Box 2—NGO ACTIVITIES

Live personal meetings to coordinate with other NGOs	.82
Joint events with other NGOs	.47
Meetings to communicate with target communities	.67
Graphic media for community communication	.52
Electronic mass media for community communication	.25

having agreements with the IMM 0.33, respectively. The IMM has a certain gap in the use of ICT in its coordination with NGOs, in addition to two-way communications by E-mail between NGO managements and IMM officials. The social sector of Uruguay is quite advanced along the road that the national government has mapped out to promote the insertion of the country into the information society as early as possible. However, operational spaces for participation have not yet been created in which social organizations can have an input into those plans.

NGOs with high connectivity are the ones with the most active participation in local government.

SOCIAL IMPACTS OF ICT

The results obtained in our research allow us to evaluate current trends, changes and impacts in the use of ICT, mainly in local governments and their internal management and communication with citizens, and in community organizations in both cities. In terms of the computerization of their local governments, Argentina and Uruguay have different historical and political characteristics and different degrees of commitment to the use of the technologies, which reflect the different economic and political strategies of each country. A number of common features can nevertheless be identified:

ICT in local management

The strategies for the insertion of ICT into local management were developed by small groups of functionaries without consulting the wider pool of municipal functionaries and without conducting any impact studies. No monitoring and evaluation was done subsequent to implementation that would have permitted errors to be corrected. One notes a certain ambivalence in the perception of the impact that ICT could have on the level of citizen participation.

The integration of ICT into local management in both cities was not preceded by any campaigns to educate officials about the usefulness and potential of technological tools, nor by any serious

training in the use of these tools, except for a number of short and inadequate courses. This resulted in scepticism, fear and resistance on the part of the functionaries, caused mainly by ignorance and lack of information. Since they were not consulted about their work-related needs and the manner in which their tasks could be optimized through the use of ICT, they did not feel represented in the "solutions" provided the governments, which translates into lack of identification with these technologies.

This stands in stark contrast to the experiences in other cities of the world, such as Toronto[11], for example. There, computerization of the local government was preceded by participatory workshops. City Hall officials described their tasks and exercises were undertaken to identify those areas in which ICT would be of greatest benefit and needed priority implementation.

Nor did Buenos Aires and Montevideo organize information or publicity campaigns using the traditional media (newspapers, radio, television, public billboards, etc.) to inform citizens about the new computerized services. Information can be found on both municipal governments in their respective Internet pages, but it is first necessary to enter those pages. In Buenos Aires, there were a few notices in local newspapers or public billboards when the first three Technology 2000 Centres were inaugurated, but not for the other 17. Citizens who are not regular Internet users or who are unaware of these new services receive no information to encourage them to use the services. Information is spread by word of mouth, but not through institutionalized channels.

The successful, relatively inexpensive and technically accessible experiences of others do not appear to have been taken as possible lessons to be learnt in Buenos Aires and Montevideo. Consequently, the results in those cities have been mixed: some increased efficiency in operations—despite resistance to ICT by officials and failure to link it with a wider modernization of government institutions; and some increased information flows for officials and citizens—despite lack of publicity on what is available and delay in providing promised information tools.

It is also curious to note that in designing their strategies for the integration of ICT into local management, both governments neglected to consult with national experts in government management and/or policies for the information society—experts who are working in both Argentina and Uruguay. With the exception of a technical consultation by the IMM with the Universidad de la República, the two governments had no recourse to the know-how and expertise of the universities located in their respective cities. In both cities, the process of municipal decentralization has been accompanied by the introduction of technology, but slowly, in a manner that was not completely harmonized, and with little relationship to the experience of civic participation through ICT. The initiatives targeted to

the community did not respond so much to institutional strategies as to individual and group initiatives.

The two countries differ in their national strategies on ICT. Uruguay has placed greater emphasis on the software industry and has managed to attract Argentine companies in this sector through tax incentives. Argentina does not have a clear policy in this area, despite various government statements. Notwithstanding these differences, the perception of the potential of these technologies for government management between the national and municipal governments of the two countries is similar. Functionaries are still not fully informed or convinced about the potential of ICT as an instrument to promote greater interaction with citizens. In general, they are restricted to using them in Montevideo as a relatively inexpensive means of communication for promoting the attractions of the city abroad to potential tourists and investors. In Buenos Aires, it is a "show window" of a "new model" of modernity and efficiency.

ICT in community networks

While both countries are similar in the use of ICT by their local governments, they are markedly different with regard to the use of ICT in community networks. Both countries have a long history of social movements in community organizations, strongly influenced by European immigration in the 19th and 20th centuries. As regards the social use of ICT, however, civil society organizations (CSOs) in the two countries have taken paths that, for the time being, are different.

In Argentina, CSOs arrived relatively late to the world of computerization, particularly among medium-sized and smaller organizations. This happened despite the fact that the Internet was already widely known, if not widely used, in the country, at least in universities, companies, the media and government organizations.

In Uruguay, on the contrary, NGOs were pioneers in the use of the Internet and played a significant role in expanding its use. NGOs forming part of a relatively organized civil society—with a strong trade union movement and many co-operative type associations—used ICT initially to become integrated into global networks; later, they used ICT for communication purposes at the local and national levels.

With regard to the establishment of networks, Argentine CSOs acted individually. Very few were part of institutionalized networks, and no national federation of NGOs or CSOs existed to facilitate work in this area. This characteristic has carried over to their use of ICT: organizations that use ICT do so in internal networks, not in interorganization networks, although the establishment of informal networks for the exchange of information has been noted. In Uruguay, while we have not seen any formal national networks, there is a noticeable trend towards linkages between NGOs that are regular users of ICT.

ICT relationship between community organizations and the State

The two countries have a common point as regards State-community ICT relationships. On the one hand, Argentine organizations proclaim the need to give the State greater responsibility for the dissemination of ICT and to facilitate access to it. On the other hand, State official declarations speak of the need to disseminate these technologies in civil society. In the area where there should be a meeting between the two parties, a glass wall has developed that has prevented the State and civil society from coming together. With few exceptions, there are no points of contact between the CSOs and the Internet Centres of the various national and local programmes, which were not conceived to "create a community".

A similar process is developing in Uruguay, despite the fact that the emerging system of free access Municipal Internet Centres in the libraries of the District Community Centres of Montevideo suggests a possible meeting through the use of these Internet Centres by the CSOs.

In both countries, the trends detected suggest an early increase in civic expression through ICT. This is prompted by recent plans and interest arising in the first and second sectors (the State and private sectors) which seek to develop computerization and telecommunications. It is essential to follow-up these processes in real time. There should also be periodic evaluations of how much initiative is taken by the third sector (civil society organizations) in the use of computerized systems and of which models of public participation are being adopted.

In Uruguay, there is a certain lack of correlation between actors and objectives, but all three sectors are politically oriented towards the integration of the country into the information society. This promotes more effective integration of the CSOs into the information society in the medium term and at the municipal level. In Argentina, the three sectors have a positive and explicit discourse on the need to integrate the country into the information society, but there are no linkages between the various actors or the scope of activities of each actor. The result is slower integration of civil society organizations into the information society, at least in the short and medium term.

ICT, democracy and social capital

Research shows, among other things, the difficulties of harmonizing social, administrative and technological policies. Tsagarousianou *et al.* (1998) mentioned a United States study by a group of experts "First Reflections Report", which states: "The Information Society must be about people. We must place people in charge of information instead of using information to control people"[12]. In general, in many of the countries in which "electronic democracy" has been implemented—and this includes both E-government and citizen participation, individually or in organizations, through electronic means—the results have not matched these concepts.

There are various reasons for this:

1. Decision-making in the area of science and technology has historically been, and still is, less democratic than other types of policy decisions (Sclove, 1995). The technical complexity of ICT policy formulation excludes many lay people and prevents them from becoming involved. While social groups or community organizations often intervene and help to modify decisions by their criticism and pressure in matters of transport, economics, environment, health, security, education, etc., until recent times there have not been similar interventions on scientific and technical questions[3].

The Information Society must be about people. We must place people in charge of information instead of using information to control people.

2. Government ICT initiatives generally use the language of democracy, but are not based on a body of academic research from which theories on cyber-democracy can emerge and develop. In fact, there is no empirical research basis for the debate and a lack of intellectual criticism of the alleged democratizing effects of ICT. The academic community has resisted recognizing that the social impact of the ICT is an issue deserving sustained attention. On the other hand, government officials also resist consulting academics working in these fields.

3. Technological innovations are taking place in a changing political atmosphere. Politically and in terms of efficiency, it is no longer accepted that there should be rigid government control of the organizations and institutions that implement and disseminate these technologies. The investments needed to keep up with technological developments are not within the reach of many government budgets, particularly at the local level. The monetarist thinking in vogue, with its emphasis on control and reduction of public spending, means that it is private capital that finances these technological developments (Tsagarousianou *et al.*, 1998).

The emergence of different types of social movements, both local and global, maintained by information networks suggests the need to develop more and better in-depth empirical research into electronic government and electronic democracy. Our own research reveals that electronic government in the countries under consideration will not be fully developed if it is not based on prior studies of the needs of the population in communication and participation, on

Government ICT initiatives use the language of democracy, but have no basis in empirical research on the alleged democratizing effects of ICT.

profound changes in national institutional cultures, and on participation by academics and civil society organizations in formulating social and technological policies for cities. On the other hand, many of the objectives pursued by civil society organizations will not be achieved without fundamental changes in the structures for the regulation of technology and telecommunications.

Recommendations on these points have significance and weight and require attention from all sectors and citizens because of the potentially transforming power of information and communication technologies. As noted by Stefano Rodotá (1999), "the innovations introduced by information technologies have importance for citizens because they are part of literacy and because they end in the reconfiguration of democratic processes". ■

Notes

[1] The research team included Silvia Lago Martínez, Alejandra Jara, Pablo Baumann, Alén Pérez Casas, Martín Zamalvide, Mariano Fressoli and Raquel Turnbaites, under the programme "Social Impact of the New Information and Communication Technologies and in Latin America," IDRC-FLACSO/Ecuador.

[2] Interconsult. Published in the newspaper *El País* of 13 August 2000.

[3] CENOC, *Building the Third Sector in Argentina*, 1998.

[4] The typology used was established by CENOC, which classifies organizations into community-based and support organizations.

[5] The typology used was established by Mr. Juan Grompone on http://www.montevideo.com.uy/genexus/51.asf.

[6] The typology used was established by http://www.isc.org/ds/WWW-200101/dist-bynum.html.

[7] The typology used was established by http://www.uruguayenred.org.uy/informacion_general/agenda/agenda.htm.

[8] The typology used was established by http://www.bibliored.edu.uy.

[9] The typology used was established by http://www.cptic.org.

[10] http://www.ucd.org.uy.

[11] See: S. Finquelievich, J. Kanel, G. Kisilevsky: "Cybercities' Computerization and local management", 1996, which describes the participatory process of computerizing the City Hall of Toronto, as well as a comparison with the Municipality of Buenos Aires.

[12] The power of paraphrase.

[13] Mention should be made of the demonstrations organized in 2000 by researchers and academics in Argentina against the Science and Technology Plan developed by the State Secretary in this sector, Dante Caputo.

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Educating Citizens of the Global Learning Society

by MICHEL J. MENOU

What quotient of learning and quality of knowledge is being achieved in all the computer networking and electronic consumerism now so widely trumpeted in the world? Is the rush to information-communication technology serving human social and educational goals—or swamping them? These are some of the strong questions and cautions which are raised by Professor Michel J. Menou, Department of Information Science, City University of London.

INTRODUCTION: RETURN TO THE GARDEN OF E-DEN?

The spread of information and communication technology (ICT) in all areas of human endeavor and all corners of the planet has turned the prefix "E-" into a compulsory attribute for any activity to matter. One can see networked computers almost everywhere, and they are supposed to bring all sorts of benefits through radical economic and social transformations. According to a linear vision of the history of humankind, advancing from age to age as a result of technological changes, we would be now in an "information age" and that would be "progress". As human beings were happier with fire than without it, with a cow to milk than a mammoth to hunt, with an electrical pump than a water wheel, they are supposed to be happier with an Internet-enabled cellular phone than with hand-written letters or any other traditional means of communication.

This is not to say that technological developments did not result in noticeable advantages for humankind. But their negative effects are too often overlooked. More important, the rationale for these advances is increasingly the profit of those who sell them, rather than real needs expressed by the people who buy them, or conservation of nonrenewable natural resources, or—even less, of course—the interests of those who will never be able to buy them. In any case, the dominant discourse, not to say propaganda, is that E-verything in this latest age is new, different, unprecedented, and, of course, exciting and wonderful.

If something is indeed new in the transformations we are living through, it is their pace. Muscular energy which for millions of years was the main source of power has been substituted by all sorts of engines in less than two centuries. The big question is how long could it take for ICT to substitute the human brain. So-called cyberspace is already populated with a fast-growing number of intelligent agents, cyborgs, netbots and other strange creatures. Within a relatively short time, roughly half a century, we have witnessed, at least in literature and policy statements, the succession of the information explosion, the information age or society, the knowledge society and now the learning society, not to mention the intelligent society. Even though some societies fail, no society has ever deliberately tried to be a stupid one. Should this hurt the worshipers of the "new", the very basis of any society and living system is, and has always been, the communication of information that eventually carries knowledge.

However, when watching today's advertisements by ICT companies, one sometimes wonders if there was thinking before the computer. It is far from being established that "information" activities are more important in contemporary societies than they previously were. And if their predominance is to be measured against such facts as, inter alia, the turnover of advertising companies, one may have some doubts about the knowledge content of the "new" society.

Most concepts related to information, knowledge and learning have for many years resisted any commonly agreed definition. However, if there is one aspect of these transformations about which some general agreement has apparently been established, it is the importance of human resources. All factors involved in the knowledge cycle are important, but ultimately it relies upon human beings.

digital literacy ◆ E-readiness assessments ◆

DIGITAL LITERACY

It is assumed that most transactions in the new society will in a near future be mediated by information and communication technologies. In such an environment,

the ability to harness ICT is certainly critical in the production of material and nonmaterial goods and services and, more important, in their consumption. It also applies to social activities such as education, entertainment, art, and even more intimate ones. One can already witness that the computer screen has taken the place of the bookcase as a compulsory piece of set design for televised interviews of important people.

For the population at large, digital literacy is equated with basic skills for operating computers, using elementary functions of standard softwares (e.g. word processing, spreadsheet, electronic mail, web browser). Digital literacy also includes the ability to make use of computer networks, in particular the Internet, and to access the resources available through them. It is assumed that such basic skills should be imparted as part of compulsory general education. Schools' access to the Internet and ICT integration in the curricula are thus expected indicators in "E-readiness assessments," such as the one proposed by the Center for International Development of Harvard University (1). For the work force in general, additional skills may be required according to the range and sophistication of ICT applications in particular functions. They can eventually be imparted on the job or through ad-hoc training. A key segment of the work force is, of course, the ICT specialists who install, maintain, operate and develop ICT infrastructure. Telecommunication and computer specialists form the bulk of this group. Interestingly, information professionals (e.g. records managers, librarians, information architects, knowledge managers, etc.) are often omitted in counts of the ICT workforce.

◆ computer-mediated communication ◆ information pollution

It is probably symptomatic of the exclusive perspective of a technological push that the ability of economies to adjust to the ongoing changes is usually measured by the number of computer and telecommunications engineers and the number of schools where they are educated, possibly combined with similar measures for the hard sciences and R&D expenditure in these areas. Eventually, members of the ICT work force, or more broadly engineering graduates, are the only human factor considered in systems of indicators such as that developed by Mansell and When (2). This reflects the domination of a "post-industrial" model which assumes that only "knowledge activities" are of importance. It may grossly overlook the relationship between physical and mental activities, which was convincingly demonstrated by Leroi-Gourhan (3). One may wonder if the spread of passive modes of acquisition of information, especially through images, is not already resulting in the impoverishment of language that can be observed in the "advanced" societies.

Efforts toward achieving print literacy have been blessed with limited success up to now. According to UNESCO estimates (4), for instance, the literacy rate of the African countries with respectively best and worst figures in 1980 had improved by only 6 per cent by 1985, or 0.4 per cent per year. At this rate, one

◆ glob-oligopolization ◆ ICT penetration ◆ aliteracy ◆

may be worried about the effectiveness of digital literacy programs of the future. In the meantime, some observers are already worried about the growth of "aliteracy"—that is, deliberate nonreading by literates in the advanced societies where TV, movies, and soon the Web are becoming the main source of information (5). Having seen the Notre Dame de Paris musical on TV would not necessarily make someone aware of Victor Hugo, especially if his name is omitted from the credits.

BEYOND DIGITAL LITERACY

The usual perspective on digital literacy is nothing more than instrumentation of human beings. Basically it tries to suit people to technology so that the latter can be generalized. The use in information policy documents of the word "penetration" rather than "adoption" of ICT when discussing digital literacy requirements is perhaps also revealing (6). In the same vein, all other obstacles to ICT applications are to be removed or adjusted. This is the case, to name a few examples, with the rule of separating carrier and content which was once the cornerstone of telecommunications deregulation, and with the long-standing fair use rules in copyright laws. The global nature of networked information systems combined with other macroeconomic trends, often ill designated as "globalization" (instead of "glob-oligopolization" for the creation of global oligopolies), results in a number of not so innocent language changes. What were known as countries or nations are now often referred to as "economies." Indeed, the role of the State in protecting identity and common goods is challenged from all possible angles. Being connected is being turned into a social obligation, if not (yet) a legal one.

In fact, the use of ICT, especially by the general public, is often propagated in a way quite similar to addictions. For youngsters in "advanced societies," the cellular phone is progressively replacing the cigarette as a symbol of adulthood. Special promotions by operators at the beginning of the school year play a non-trivial role in establishing this fashion. While cellular phones may possibly respond to a number of needs of the young and the parents, it is hard to find an essential one which was not satisfied in previous times. The need to be able to reach the kids at any moment is mostly a consequence of urban insecurity and

declining discipline. It is intriguing that the only important question does not come to the fore: Do human beings need to be connected by means of ICT? If yes, what for?

EDUCATION FIRST

If one considers that answers to these questions are the key to policy formulation and that the answers should come from the people themselves, the scope of digital literacy discussed above is fully inappropriate. It may indeed work as one more driving force toward addiction. Being only able to use the tools raises the risk of being used by them.

mediacy ◆ Google search ◆ E-commerce platform ◆

Unless one bets that voice or sign driven computer systems will become widely available in the near future, basic literacy and numeracy remain fundamental requirements for people to use ICT. It does not seem that plans for achieving digital literacy pay much attention to these prerequisites, even though illiteracy remains widespread in developing countries and is far from eradicated in developed countries. As the use of images and graphics is becoming increasingly important and pervasive, people need to learn how to interpret them in order to achieve understanding rather than merely being impressed.

As forms of publishing and broadcasting evolve and diversify, people should learn how to analyze the way information is presented and how to find their way around its various formats. As more and more information resources are made available, people need to know how to find and select them and how to use the tools which are supposed to assist them in their searches. People need at least basic skills that can allow them to express themselves with the more common media and be listened to. The number of mistakes made by regular users of electronic communication devices shows that practice is far from sufficient. The understanding of and ability to use a variety of multimedia carriers for both receiving and sending information is far more complex and demanding than the literacy of the print or speech. This is why it would better be called "mediacy" as suggested by Toni Carbo (7).

So, rather than being simply able to launch a search on Google, one should be able to do it purposively, knowing what results to expect and why. Would this be sufficient? For consumers of ready-made resources, maybe. The Internet is often referred to as "the largest library of the world", which, by the way, also applied to the library of Alexandria, in its time. Unfortunately, what the Internet contains is mostly formal information from the advanced countries. Many continue to say that it contains the ultimate of human knowledge and thus is what anyone needs to have access

to. However, on the contrary, most of the world information resources are not accessible and relevant for the majority of the inhabitants of this planet. In the meantime, a wealth of information and knowledge, usually referred to as "indigenous" knowledge and more generally as tacit knowledge, is not preserved and is available only to small groups within the communities where it originated. ICT can no doubt help in securing broader and lasting availability of this knowledge, which by the way has been grossly overlooked by the industrial society. Its transmission rules do not follows those of consumerism, but it might greatly enhance the digital environment if it adapted those rules. In any case, in order to fully exploit ICT for creating local and relevant content, people need far wider skills than what digital literacy programs usually consider—that is, simple web page creation.

Some think, though not stating it so blatantly, that the inability to use ICT, which is a key component of the "digital divide", is primarily an obstacle to the expansion of the markets for digital products and services. The rationale for reducing the digital divide is to grab the digital dividends. Those who focus on ICT's potential to support if not boost efforts toward sustainable development are more concerned about the ability of people to make sound judgments about their present condition, its causes and ways to improve it, including the eventual use of ICT. This is primarily a matter of general education, beyond the prerequisite of political and social openness. For a cooperative of craftsmen to "sell on the Internet" access to a readymade E-commerce platform or portal won't make any difference if the cooperative's members cannot understand the financial requirements, the regulations and above all the market rules that govern their business. This requires in the first place a good general education. As the demand for it is expanding and available traditional resources become insufficient, the extensive use of ICT in order to amplify education is certainly necessary and appealing.

However, it is an illusion to count on ICT for getting rid of the basic ingredients of pedagogy, in the first place teachers and mentors. Even though the role of educators is radically transformed in open and distance education, professors are becoming much more the "learning managers" that Barbara Flood (8) wished, and ICT-based education means more instructors and more instructor-learner interaction, not less. More attention should be paid to the intellectual and human requirements, capabilities and values that are required to sustain the information society.

REDISCOVERING LIBERAL EDUCATION?

Formal education is undermined by contradictory factors. The young generations strive for the highest diploma, seen as an insurance of employment. Employers look for new entrants in the workforce who can be immediately operational. Educational authorities look for highest achievements, such as 100 per cent of the age group successfully completing secondary education at the lowest possible cost. Subjects and specialties proliferate. The spirit of the time is to make everything, including learning, easy, enjoyable and effortless. All these forces are working against the improvement of general education. Not the least is the illusion that cost-effectiveness calculations can apply to the breeding of intelligence. As a result, formal education is driven away from the formation of the mind and the person. It becomes more and more an instrumentation. As B.K. Passi stresses in an inspiring note (9): "Critical and creative thinking have to be the hallmarks of new education. We reemphasize that the four pillars of education would mean: learning to learn differently, learning to do differently, learning to live differently, and learning to be differently."

There is no doubt that all types of education, informal, nonformal and formal, should be reoriented so as to pay appropriate attention to helping in the formation of critical and creative minds. However, this is not likely to be achieved in the short term because of the above-mentioned conditions, and also the resistance of established models and institutions. Also, it is often wrongly advertised that the profusion of information resources offered by ICT can help to re-orient education. This possibility is refuted by the requirements of physical access, which are unlikely to be met on a sufficient scale. And this possibility is radically opposed by the unprecedented expansion of intellectual property rights; these can go the extreme absurdity of recognizing an "original creation" in the arrangement of common words into an odd slogan like "inspiration technology" or "talents integrator", assuming it was done by a major company.

Far more important is the socialization of knowledge which ICT facilitates through a variety of modes of communication and a variety of participants. The proliferation of these opportunities and the lack of experience in computer-mediated communication result, however, in negative effects such as information pollution and dispersion. Handling of individual and conference electronic mail, not to mention unsolicited mail, is consuming a significant and increasing portion of Internet users' time at the expense of more productive or rewarding activities. Efforts at developing appropri-

◆ citizenry of creative learners ◆ intellectual capital ◆

ate methods and collective culture for the effective use of these new tools, such as the Mistica project (http://funredes.org/mistica/) need to be expanded.

Even though the expression, like most of those trying to depict the "new" era, is unfortunate to say the least, "learning society" is a concept which emphasizes the social processes of facilitating everyone's assimilation and creation of knowledge as the essential fundament and priority concern of all components of society. All societies and their members learn, of course. But this may be left to natural processes, except for compulsory education, whether initial or in-service. Beyond the latter, learning does not receive particular attention. It can, on the contrary, become the central piece of all constructs, institutions, processes, activities. While there seems to be an apparent general consensus that becoming smarter is indeed desirable, there is less obvious support for the direct consequence of this premise, which is that everything should constantly change, and

tual Capital and make it blossom. An intelligent city will never emerge from the wiring of a locality populated by senseless, uneducated, untalented, initiativeless and oppressed people. Conversely, many cities were intelligent over the centuries without ICT. This is probably what led Stephen Denning, the former head of the knowledge management program at the World Bank, to emphasize the development of "nurturing knowledge communities' (10).

These attempts at formulating "new paradigms" more often than not omit the principal question: What for? As long as the growth of the Gross National Product will not be replaced by the growth of the Gross Universal Happiness, or Harmony, as the main yardstick, the paradigm shifts may not be more than fresh paint on an old vessel. GUH cannot be defined by economists and national accounts specialists, nor by big business, which pretends that frequenting its supermarkets is part of "true life", nor by governments, which confound it

nurturing knowledge communities ◆ virtual communities

hopefully improve, on the basis of the lessons learned in applying knowledge.

There is no question that societies need a citizenry of creative learners. Not less important, however, is the collective ability of social, administrative and productive structures to make use of them. What may be subsumed is the ability of these structures to manage their Intellec-

with reelection or obedience to their doctrine. It can only be defined by conscious people themselves. This is one more reason why they need true education rather than retooling toward ICT.

PEER-TO-PEER EDUCATION

ICT is only one tool among many others that can support learning. Learning how

to apply ICT is necessary. More important, however, is learning how to succeed in one's efforts toward a better, happier life using ICT and all other means. From the latter perspective, it matters much less for everyone to be kept posted of advances in the work of all the media labs of the world than to be able to share experience in effective and socially responsible use of ICT in support of development goals of the people. In this respect, all societies are somewhat more equal than they are with regard to other criteria. In a few decades, there have been advances in the general application of ICT and some societies have developed a notably superior ICT infrastructure.

◆ telecenters ◆ Internet-enabled cellular phone ◆

But these strides make little difference from the standpoint of a society learning toward happiness, compared to the millions of years of mental and social construction humankind went through. Recent history has often demonstrated that the more powerful is not necessarily the smarter nor the winner.

Virtual communities of all kinds are currently mushrooming in all parts of the world and for all sorts of purposes, though not in a coherent and effective way. For practical reasons they tend to remain focused on special and/or local concerns. But networking among them at the regional or global levels is already taking place. Isolated or deprived communities can take advantage of collective organizations such as telecenters that support their learning and development efforts with shared ICT facilities. It becomes easier for people anywhere to learn from each other's experience, share ideas, develop solidarities, embark on joint ventures. This is how culture developed over the ages, but now the process can be much faster and wider. (Unfortunately, this also has negative aspects, such as the ease with which unethical endeavors can develop and eventually succeed.)

A high priority should thus be given to creating conditions which enable virtual communities to share insights about networking processes and to engage in learning from each other. This does not require, by the way, large national or international plans with their usual corollary, predetermined projects that are supposed to change the world according to a fixed and tight schedule. Speaking of learning, it is striking that some 50 years of experience with top-down, project-based development cooperation has had mixed results, to be diplomatic—or persistent ineffectiveness, to be realistic—and has apparently not brought any change. On the contrary, what could prove far more effective is funding for start-up and troubleshooting of locally designed initiatives which meet minimal preconditions and contribute to specific objectives within a broad agenda.

A basic ICT infrastructure is obvious-

ly one of the requisites for interaction, though it does not necessarily mean that each adult should be equipped with all the devices in existence. But access to and use of ICT should in the first place be autonomous, voluntary and—so to speak—natural. Except for a limited audience and specific purposes, the idea

cyberspace ◆ intelligent agents ◆ cyborgs ◆ netbots

of building an overall knowledge-sharing instrument at the initiative of a single authority should remind us of the tower of Babel, and be avoided. ICT and the Internet, in particular, are like the Delphic oracle: they can give information, they cannot change destiny. It is people with understanding, vision, hope, energy, space to move, and luck, who make the changes. ■

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REACHING the Last Mile

by CARLOS A. GAMBOA, RON LAPORTE & FRANCOIS SAUER

Is there a shortcut method for overcoming the "digital divide" between rich and poor countries? Faster speed and wider access to global information could be achieved by creating Internet hubs which then feed traditional channels. The idea comes from three medical doctors concerned with improved health communication: Dr. Carlos A. Gamboa, former Regional Advisor of the Pan American Health Organization; Dr. Ron Laporte, Professor of Epidemiology in the Public Health School of the University of Pittsburgh, and Director of the WHO Collaborating Center on Diabetes and Telecommunications; and Dr. Francois Sauer, a medical informatics consultant.

WE LIVE IN A PERIOD of constant transition. We can expect rapid increases in the rate of change as the population doubles over the next few decades. One source of this change is technology. Another source is knowledge and information. The fund of information available to the individual doubles every five years. More people, more tools, more knowledge. The future promises us more changes than we have ever experienced before.

The rise of information technology as an artifact of everyday life in the modern world has brought with it the dawn of a new era often dubbed the "Age of Information". It is changing the way we perceive the world, how we think and communicate with one another, what we learn, where we work, entertain ourselves, spend free time, shop and even meet people. The Internet provides one example of a virtual environment where these changes in perceptions and relationships are constantly occurring, enabling new social realities to develop. Today, partially because we manipulate information with

great ease, we are discovering the reality of our social constructs.

The Internet has become widely useful with most remarkable speed. It has been accepted much quicker than the telephone or the radio (table 1). And its users numbered over 275 million people as of early 2000 (table 2). As the Internet races ambitiously toward critical mass, however, some social scientists are beginning to examine carefully the policy implications of current demographic patterns of Internet access and usage (Hoffman, Kalsbeek, and Novak, 1996; Hoffman, Novak, and Venkatesh, 1997; Katz and Aspden, 1996). Not surprisingly, access is not distributed randomly, but correlates strongly with income and education levels (Coley, Cradler, and Engel, 1997). Looming large is the concern that the Internet may not scale *economically*, leading to what Lloyd Morrisett, the former president of the Markle Foundation, has called a "digital divide" between the information "haves" and "have-nots."

Looming large is the concern that the Internet may not scale economically.

Table 1—TIME TO REACH 50 MILLION PEOPLE

	Years
Radio	38
Television	13
Cable television	10
Internet	5

Table 2—USERS ON THE INTERNET IN MILLIONS (FEBRUARY 2000)

USA and Canada	135.06
Europe	71.99
Asia/Pacific	54.90
Latin America	8.79
Africa	2.46
Mideast	1.29
Total	**274.49**

It is important to point out that, while 70 percent of the schools in the United States of America have at least one computer connected to the Internet, less than 15 percent of classrooms have Internet access (Harmon, 1997). Further, although numerous studies (see CyberAtlas, 1998) suggest that the gender gap in Internet use appears to be closing over time, the perception persists that the gap for race is not decreasing (Abrams, 1997).

NEXT INTERNET GENERATION

In coming years, dramatic technological and economical changes will shape the next generation of the Internet. One change will be Internet Protocol version 6 (Ipv6–128 bits of addressing), for which allocations were officially announced on July 4, 1999 by the Internet Assigned Numbers Authority (IANA) [www.iana.org]. In the new Internet generation, everything will be available on

Internet Protocol, including TV, radio, telephony, print, and media. It will have a heavy emphasis on value added software services, as well as strong business orientation.

Governments will face important economic, technological and political challenges in order to succeed in the deployment of the Internet Generation. Scaling in all telecommunications infrastructure hardware and software will impact speed, size of the network, X bandwidth product, number of devices and users.

Also, an important transitional issue arises with SIE or Standardization Information Exchange programs (XML Syntax and Semantics). These programs are designed to bridge a company's existing business vocabulary to today's e-commerce language, while maintaining contextual definitions on both ends.

In international political fora, governments will work to develop and implement policies regarding cryptography and export standards, trademark and copyright, regulatory framework, convergence (TV, radio, telephony), taxation, censorship and digital signature.

OUR MISSION: REACHING THE LAST MILE

A grand challenge for the 21st century has emerged for our governments and societies: bringing information from the Internet to all, and achieving the globalization of the world of science and health. There were great hopes in the 1990s that the Internet would bring researchers closer together and that research findings in the laboratory would be rapidly translated into far-reaching community use. However, we now see disappointingly large gaps in information access between the scientifically rich and scientifically poor countries. The fear is that the poor countries will fall further behind, as the gulf in science and health information has widened from a small creek to the size of Pacific Ocean—an insurmountable task.

Having Internet access in every house is like chasing windmills: noble, impossible and probably not needed to obtain scientific information.

The model often cited as a target is a global universal Internet with access in every house. The reality is that this will not occur even in the richest countries—the UK and US will never approach 100 per cent computer saturation—let alone in Zambia, Bolivia, Vietnam and other developing countries. Having Internet access in every house is like chasing windmills: noble, impossible and probably not needed to obtain scientific information. What is important is access to scientific information. The Internet is essential, but not indispensable.

We can learn about global information systems from history. An important lesson for the digital age occurred when railways connected over 2 per cent of the communities in a country. Individual

connectivity was still low, but the railway was a success in terms of information delivery. The railway served as the backbone, delivering mail to information hubs where traditional means of distribution took over. There was an enormous effect on the speed of mail dissemination.

WHAT MIGHT THIS MEAN FOR THE DIGITAL DIVIDE?

Instead of making expensive investments to deploy the Internet for universal access and connectivity, countries should perhaps view the Internet as a backbone linking a network of inexpensive hubs.

For example, in western Kenya, ideally all physicians, scientists, teachers and students would be on the Web, but this is impossible. We can close the digital divide in Western Kenya by bringing the Internet to knowledge distribution hubs in Nairobi, and then deliver content using traditional means of information distribution already in place. In the health prevention sector, the Global Health Network (GHNet—see http://www.pitt.edu/HOME/GHNet/GHNet.html) has deployed this concept using a network of thousands of outstanding scientists and academics who share their lectures in the Internet, and for those without access or connectivity to Internet the lectures are distributed free on compact disc format.

Countries should view the Internet as a backbone linking a network of inexpensive hubs.

These means include teaching, libraries, fax and photo copies, reproduction in local publications, lectures, and word of mouth. Examples of such brokers in the nonprofit sector already exist—for example, satellite, International Network for the Availability of Scientific Publications (INASP), Health Information Network, HealthLinks, WomenAction, Women Ink, to name a few).

With globalization, there should be a new worldwide trade of "information brokers" who would have access to Internet hubs. From there, they would facilitate or sell access to others who need and want scientific, educational, health and other kinds of information. Such brokers may be the key to bridging the digital divide. With competition the speed of scientific information distribution will increase and the costs will decline. ■

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Afriboxes, Telecenters, Cybercafes: ICT in Africa

by MIKE JENSEN

African countries can make leapfrog jumps forward in communication connectedness by adopting new technologies—necessarily using different strategies than developed countries followed. The process in Africa must be tailored to such specific conditions as generally low income levels, limited formal business activity, the much greater importance of the rural population and small producers, and shared use of such communication resources as newspapers, Internet accounts and village TV sets. These factors are discussed by Mike Jensen, an independant consultant based in South Africa, who has helped establish information-communications systems in over 30 African countries, and internet services for nongovernmental organizations in Canada, Australia and South Africa.

THE POTENTIAL OF INFORMATION and communication technologies (ICTs) to transform development is now receiving great attention worldwide. Using the catch prase 'Bridging the Digital Divide', NGOs, corporations, national governments, and global compacts such as the UN and the G8 are all marshalling resources to use ICTs for improving development in the South.

ICTs are being seen as an enabling tool with a multiplier effect that can cut costs and improve the quality and delivery of basic infrastructure and services.

The prospect of new opportunities for economic growth is also heralded, which in turn will hopefully provide more finances for government programmes. ICTs are also given the potential of transforming governance and improving the ability of marginalized groups to participate—from the local grass root groups to national governments, to regional and global forums which often have insufficient representation from the South.

As the region with the most LDCs, Africa is often seen as the "perfect case" for the application of ICTs. But when basic facilities such as fresh water and primary education are still lacking in many African countries, questions have also been raised about the efficacy of such a strong focus on ICTs. This article attempts to identify some of the factors in developing appropriate strategies to use ICTs for development in Africa.

The term "ICTs" should first be clarified. Generally, ICTs are seen as the telecommunication infrastructure, computers and applications which have combined to give us the Internet. But we should also not forget that there are the broadcasting media—TV and radio—which have much higher penetration rates in Africa than telephones or computers. And with the convergence of all these technologies, there are a number of new developments in this area which can increase the potential impact of ICTs. And then of course, most important, ICTs also need to include the human resources that are needed to develop, install and operate the equipment and software, as well as to set and enforce policy around their use.

The use of ICTs has grown rapidly in most urban areas in Africa. As an indication, four years ago only a handful of countries had local Internet access; now the Internet is available in every capital city. Hundreds of new local and community radio stations have been licensed, and satellite TV is now also available throughout the continent. While penetration and use of ICTs is still very low compared to more developed countries, there are already many interesting examples of how these facilities are being exploited to improve the livelihoods of Africans.

Initially, the most immediate impact has been in the use of e-mail to reduce the cost of international communications. This has allowed many individuals, NGOs and other organisations to improve management, obtain resources and generally achieve much better communications with their family, friends, colleagues and partners around the world. A visit to any of the rapidly expanding number of cybercafes and telecentres which are now springing up in secondary towns and even

Four years ago only a handful of African countries had local Internet access; now the Internet is available in every capital city.

remote villages shows that email is still the 'killer application', and that these centres are being used by increasing numbers of locals, and not just by computer literate western tourists.

While the low level of ICT penetration amongst the public in Africa has so far limited the use of ICTs by national governments for governance purposes, many administrations are beginning to streamline their operations and improve internal efficiencies by adopting ICTs within the organization. For example, the government of Lesotho recently declared that all announcements for cabinet and committee meetings would be made only by e-mail. Some administrations such as those in South Africa, Algeria and Tunisia now provide immediate global access to tenders via the web. Health and education departments in many countries are beginning to electronically transmit operational MIS statistics such as disease occurrences and pupil registrations. In South Africa, the results of blood tests are being transmitted to remote clinics that are off the telecom grid via mobile telephone text messages. As greater numbers of public officials are now gaining low-cost access to the web, the vast information resources available via Internet are becoming increasingly important tools in ensuring informed decision-making.

Lack of timely information is well known to be the largest constraint on small-scale agricultural production and natural resource exploitation—a sector that provides livelihood for 70 to 80 per cent of Africa's population. However so far, the potential for ICTs to impact this sector has not received the attention it deserves. An immediate and relatively simply fulfilled need is for improved access to market prices. Local farmers or miners often cannot obtain up-to-date market information, so travelling traders are able to negotiate low prices. With improved information systems they would be able to obtain much better market-related prices. Going a step further, farmer and fishing organizations will be able to band together to sell their produce directly to distributors. For example, in West Africa a women's fishing cooperative operates a web site for its 7,000-plus members. They promote their projects and market and negotiate prices with buyers overseas.

However, one of the most interesting trends to emerge has been in the area of job creation. The scaleability of ICTs lends itself to their adoption by small and medium-size enterprises which can provide much needed local communication services. Furthermore, the "'death of distance" provided by the Internet has meant that there are even greater opportunities to be found in exploiting the much larger information and communication-based economies of the more developed countries.

Some examples of these include:

- In Senegal public telephone and cyber cafe services are being provided by over 10,000 small businesses with about 15,000 to

20,000 employees.

- A local Internet service provider in Morocco has won a contract to digitize the paper archives of the National Library of France. They are scanned in France and sent by satellite link to Rabat where they are edited by keyboard operators .
- In Togo and Mauritius call centres now provide telephone support services for international companies with customers in Europe and North America. Callers don't realize they're calling Mauritius or Togo. They pick up the phone, dial a local number and are routed through to one of these countries, where operators provide the support that they require.
- In Cape Verde "virtual security guards" have found jobs using the Internet to monitor webcams in office parks on the east coast of the US. They notify local rapid response teams there if they see anything amiss.
- Many African craft makers are selling their wares in the worldwide web, supported by NGOs such as PeopleLink.

While these developments are encouraging, unfortunately there are rather too few of these examples, largely because of the low level of penetration of ICTs in Africa. There are only about 1,300,000 dialup Internet subscribers in Africa. Of these, North Africa is responsible for about 250,000 and South Africa for 750,000, leaving about 300,000 for the remaining 50 African countries. As each computer with an Internet or e-mail connection usually supports a range of three to five users, the total number of African Internet users is around 4 million, with about 1.5 million outside of South Africa. This works out at about one Internet user for every 200 people, compared to a world average of about one user for every 30 people, and a North American and European average of about one in every 3 people. There are now about 38 countries with 1,000 or more dialup subscribers, but only 11 countries with more than 20,000 subscribers—Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Nigeria, South Africa, Tunisia, Tanzania, and Zimbabwe.

Limited telecommunication infrastructure is seen as one of the principal causes of this low level of ICT penetration. In 1999 the ITU estimates that Africa had about 18 million telephone lines—about one phone for every fifty people. If North Africa and South Africa are excluded, about 3.5 million lines remain (less than the number of lines installed in China every year), which works out to about one in every 200 people. Access to public phones is similarly restricted, with about one for every 15,000 people, compared to a world average of about 1 for every 600. Aside from limited penetration, telecommunication costs are high, especially when compared to per-capita incomes, and these also contribute to high Internet costs. The average subscription fee of around US$50 per

month is more than the average monthly salary of a person in Africa.

Only 17 countries on the continent have local dialup Internet access in the secondary towns or urban areas outside the capital city. This means for the majority of people (the average urbanization rate in Africa is only around thirty per cent) that even if they could afford an Internet subscription, a computer and a phone line, it would still be a long distance call to use the net. Even when better coverage is achieved, high local call charges still make it too expensive for most people to use. The average local call tariff is around US$ 2.50 an hour, in ten countries it is more than US $4, and in a few it is over US$ 8 an hour. Even more worrying, there is a trend to increase the costs of local calls relative to international calls as telecom operators rebalance their high international call charges in preparation for competition.

There are a variety of efforts under way to restructure national telecom operations and build better national and international infrastructure. But many of these have lacked a cohesive approach built on a clear understanding of the dynamics and impact of the blindingly fast changes in communications technologies. In identifying appropriate strategies for the provision of ICTs, the first point to note is that models of infrastructure provision are likely to be quite different from those employed in developed countries. This is so because of the generally low income levels, limited formal business activity and the much greater importance of the rural population—up to 80 per cent of the people may live outside urban areas.

In addressing the low-income factor, innovative models may be necessary which focus on shared infrastructure, public access facilities and the use of intermediaries to interact with the public who may not have functional literacy, let alone be computer literate. In addressing the rural population issue, technology choice and design options are becoming more readily apparent as technologies mature. Perhaps more important, a reassessment may be needed of the traditionally held view that rural communications services are unprofitable.

The need for subsidized rural communications emerged decades ago in developed countries. Then, telecommunication infrastructure costs were high, and most of the population resided in densely populated urban areas which could be serviced at relatively low cost in conjunction with high-volume business users. In this environment, cross-subsidization and Universal Service Obligations were needed to cover the relatively greater costs of serving the small minority of mainly residential users living in sparsely populated rural areas.

These factors are not generally applicable in Africa and other developing countries today. There, the bulk of the population is in rural areas, network infrastructure roll-out and usage costs have already plummeted, and will continue to do so for the foreseeable future. The exploding quantities of fibre, wire-

less and satellite bandwidth can make rural areas almost as easy to reach as urban ones. Also, technology convergence means that the same infrastructure can be used to provide many more services than just voice calls. In particular, the use of the Internet for transaction purposes vastly increases the added value potential of the infrastructure and thus the incentives to build it.

A reassessment may be needed of the traditionally held view that rural communications services are unprofitable in Africa.

Added to all this, the overheads of centralized national network planning are no longer required. The Internet model of network development has emerged, allowing anyone to build a part of the network and be able to sell excess bandwidth and a wide variety of services to third parties in order to help cover their own costs. Examples of this already include the Universities of Zambia and Mozambique, which have become leading Internet Service Providers to the public following the establishment of their facilities for internal use. It is no coincidence that these service providers rely extensively on VSAT (very small aperture terminal) satellite communication ground stations and wireless systems to access and deliver their services independently of the monopoly voice operators in their countries.

Appropriate ICT strategies also need to take into account that averages across the continent obscure very large variations between countries. Aside from variations in annual per capita levels of gross domestic product, which range from $200 to $7,000, and market sizes which vary from 1 million to 100 million people, many other factors vary substantially and may affect strategy. The most notable of these are:

- The communications regulatory environment. Probably the most important immediate factor, the national regulatory environment in Africa varies greatly, from relatively open competition in Internet service provision or even mobile services and the local loop, to long-term monopolies in all of these areas. In particular, very few countries allow the use of VSAT, or if they do, they levy high bypass or license fees.
- The extent of the existing infrastructure and the cost of access to it. This not only affects potential new entrants in the provision of basic services, but also those providing value added services. This can vary from 20 per cent to less than 1 per cent penetration, depending on the country.
- The existing usage of the radio spectrum. Many countries have not had adequate resources to efficient-

ly manage their radio spectrum allocation for use by telecommunications and Internet operators, either nationally or regionally, resulting in congestion in some wavebands and lack of a transparent process and difficulties in obtaining spectrum from the regulators.

- The market orientation and openness of the national government to private sector investment. Some countries are still emerging from the 'nationalization era', and many sectors of the economy are still dominated by sluggish and inefficient parastatals with close links to top executives in government.
- The general investment climate of the country, such as the level of inflation, import duties, access to local capital and foreign currency, and regulations on the repatriation of profits for international investors.
- The resources that national governments and their international cooperating partners are allocating to national information and communication infrastructure building projects. In some countries there is strong if somewhat uncoordinated support from both multilaterals and bilateral development agencies in this area; other countries have yet to begin this process.
- The reliability and extent of penetration of the national electricity grid. In many countries the power grid is only available in the major urban areas, and even some capital cities have regular outtage periods.
- The size of the human resource pool, both locally, and in the diaspora.
- The level of development of the transport networks. Where this is poor, barriers to the increased movement of people and physical goods affect the cost of communications network implementation and support, as well as the level of demand for communications services.

Strategies also need to take into consideration the large-scale sharing of information resources that is a dominant feature of the African communications landscape. Often there are more than ten readers per newspaper. As indicated above. estimates are that there are usually 3-5 users per dialup Internet account. It is not uncommon to find much of a small village's inhabitants crowded around the only TV set, often powered by a car-battery or small generator.

Clearly, one of the most important strategies for improving ICT use is the accelerated liberalization of the telecom sector, to improve the delivery of the services on the continent through competitive forces. Expanding universal service goals is also important because currently these are focussed on the provision of basic voice telephone services. Today, universal service goals should also include access to the Internet and other more advanced value-added services.

An important and often neglected part of the strategy is to improve support

to the regulatory agencies that are now emerging on the continent and to support public participation in the development of policy, rather than formulating it behind closed doors in regulators' and ministers' offices.

The question often asked in relation to telecom liberalization is: is the Internet a threat or an opportunity for the public telecommunication operators? It is clearly a threat for those operators who are not able to respond to these rapid technological changes and to regulatory and institutional fluidity. Concerns are expressed that government revenues will be reduced in the short term, and that the number of licenses should be limited to make sure that the telecom operators are not threatened by the introduction of competition and new technology. But these concerns come from an approach which generally speaking is outmoded. There are positive spin-offs to the economy and society as a whole from having a much improved telecommunications infrastructure. These gains are not worth sacrificing for the sake of protecting monopoly operators who currently only provide one or two percent of the potential connectivity really required on the continent.

It should also be noted that broadcast radio, the most widespread medium on the continent, is still relatively unexploited and could be better used as an intermediary tool in many respects for the provision of Internet information services. For example, in Sri Lanka, a local community radio station spends about two hours a day responding to questions from listeners, and then the producers research the answers on the Internet and try to provide useful Internet information, which is rebroadcast to people who don't have a computer or any other form of Internet device.

The use of the Internet by broadcasters is also providing new opportunities for cutting programming costs and obtaining audio clips or video clips for rebroadcast locally. This medium is already being used by the Panos Institute (http://www.panos.org) to provide a database of audio material for francophone radio stations in West Africa accessible through the web. NGO network SangoNet (http://www.sn.apc.org) has a similar facility for South African radio stations.

In a different area, the broadcast networks, with their much wider reach than the fixed-line telecommunication networks, are also being used purely for the low-cost transmission of data. A number of initiatives in this area have already been established to transmit web pages, e-mail and graphics such as weather maps, for example Siyanda (http://www.siyanda.co.za) and WorldSpace's data channels (http://www.worldspace.com).

One of the most immediately rapidly growing ICT developments in Africa is mobile cellular telephony using the GSM standard (Global System for Mobile), which is also predominantly used in Europe and Asia. An increasing number of countries have built cellular networks which are

equal in subscriber base to the fixed-line network. Cellular operators have expanded from a presence in only 6 countries nine years ago to about 80 networks in 42 countries. The number of cellular subscribers now surpasses the number of fixed lines in Africa, largely because the fixed-line operators are often unable to provide service and so mobile phones often substitute for their fixed-line equivalent.

In addition, a rapidly growing number of added services are provided by cellular operators, such as data transmission, short message sending, and Internet access, and even financial transactions using Wireless Access Protocol (WAP) for small mobile-phone screens. Data transmission is limited to 9.6Kb at the moment, but speeds will rise to 384 Kbps when the new GSM data protocol, General Packet Radio (GPRS) is widely available next year; trials are already taking place in South Africa. GPRS radically advances the utility of the GSM network, especially when combined with the sophisticated GSM handsets that are essentially becoming a multifunction personal computing and communication device.

These trends in the GSM sector suggest that once competition and technical advances have forced the price of hand sets and usage down sufficiently, the fixed-line operators may end up passing on most of their end-user customer services to the mobile operators and concentrating on the provision of broadband national and international connectivity.

The growth of the mobile networks has also meant that many rural areas where fixed-line infrastructure is not available are now serviced. In particular, because major roads linking cities are usually covered for mobile service, communities up to 30 kilometers on either side of these roads are now able to avail themselves of voice and limited data communication services.

Due to the relatively small number of people who can afford a phone line, let alone a computer, public access services are very much in demand. Smart-card and PIN-based public and cellular phones have been widely adopted across the continent, creating a new revenue stream in the sale of telephone air-time by small shops and telecentres. This infrastructure can also form the basis for more advanced value added telephone-based services, including e-commerce, especially where universal smart-card systems are adopted.

The demand for public phone shops and telecenters is an important opportunity for small businesses, equipment providers and franchisers. An increasing number of operators are now passing the responsibility for maintaining public telephones over to the private sector. This has already led to a rapid growth of private phone shops in many countries. The most well-known success story of this strategy is in Senegal; as mentioned above, it now has over 10,000 commercially run public phone bureaus, employing over 15,000 people and generating over 30 per cent of the entire network's revenues. While most of the phone shops are in urban areas, a growing number are

being established in more remote locations, especially with the Senegal telecom operator's aggressive rollout of backbone infrastructure which has linked 2,000 villages and towns by digital microwave and fibre-optic cable.

"Virtual phone" and calling card alternatives for those unable to afford their own phone are also an option being adopted by telecom operators in some countries such as Botswana and South Africa. Subscribers are issued their own unique phone number and pay a small rental for a voice mailbox, from which they can retrieve their messages from any telephone. A pager can also be tied to the system to immediately inform the subscriber that a message is waiting.

The high cost of computers relative to income levels in Africa has resulted in a number of innovative approaches to the provision of low cost PCs and other Internet access devices. The two main areas here are:

- The provision of 'remanufactured' or recycled PCs such as the recent initiative by the manufacturers of the Freeplay wind-up radio. They have set up a new computer recycling division called AfriBox aiming to supply Internet ready PCs for Africa costing $300. A number of international NGOs and foundations such as WorldComputerExchange.org are shipping to Africa containers of similar computers obtained as donations from large companies.
- The provision of set-top boxes and other low-cost network computers which can be plugged into a television set. These devices typically cost about $200, substantially reducing the cost of gaining access to the Internet. ISPs in South Africa and Tanzania have already begun providing such equipment.

Universal smart card and e-commerce policies are also gaining attention in a number of countries. Mauritius and South Africa are looking at a single smart card that will hold the carrier's driving licence, small amounts of funds, and health and other social security information.

Harmonization of e-commerce policies is also on the agenda in a number of countries, so that, for example electronic evidence is upheld in court and can be used in many ways for ensuring that e-commerce is correctly carried out.

It is also considered important to develop a phased approach which gives priority to such activities as the connectivity of key decision makers in business and government. In addition, policy makers need to develop an understanding of the importance of the linkages between ICTs and other basic infrastructures—in particular improvements to the transport and power supply networks, without which the potential impact of ICTs will be limited.

It is clear that the availability of sufficient human resources will continue to be an overriding issue in many areas. Awareness raising is also a human

resource issue which will continue to be important, as will be the more general need to develop the capacity to deal with the rapid changes being brought on by the use of new technologies.

The major problem in the area of human resource development is that the pool of expertise in ICTs in the region is relatively small (at all levels, from policy making down to the end-user), which contributes to the limited deployment of infrastructure and the high price of access. Rural areas in particular suffer from very scarce expertise in computer maintenance and software troubleshooting. Given the very low pay scales in the African civil service, this problem is virtually unsurmountable for government infrastructure operators who are continually losing their brightest and most experienced to the private sector and even to much higher paying jobs in Europe and North America. This situation is not unique to Africa or developing countries, but is also being faced by the developed world where infrastructure demands have also outpaced the supply of experienced staff. The only effective response to this problem is to ensure that ongoing training and capacity building is high on the agenda of every organization.

Currently the availability of specialist training in infrastructure operation and installation is extremely limited on the continent. In Africa there are only two major regional centres for training in telecommunications—in Senegal for francophone countries and Kenya for Anglophone countries. Through an ITU support programme they are expected to be transformed into Centres of Excellence in Telecommunications Administration (CETA). CETAs are intended to provide senior-level, advanced training and professional development in the areas of telecom policies, regulatory matters and the management of telecommunications networks and services.

A number of telecommunication operators maintain their own training schools, but these usually suffer from the same lack of financial resources being experienced by the operators themselves. The German international technical training assistance agency, Carl Duisberg Gesellschaft (CDG), has sent a large number of telecom trainees from Africa to Germany over the last 20 years, and many other development agencies have similar, if small such programmes. More recently, UNDP and Cisco have created a joint venture to assist in the establishment of nonprofit Cisco network training academies in all the LDCs. International volunteers are also being seen as an important vehicle for technology transfer, which will be boosted by the recently announced United Nations Information Technology Service (UNITeS) of the UN Volunteers (http://www.unv.org) and other similar NGO initiatives such as NetCorps Canada.

In general the international community has already played a strong role in training and capacity building in Africa and it is expected that this will continue

to be an important activity for developed country assistance agencies. Other examples of the wide range of projects in this area that have been instituted include:

- The Establishment of a Global Telecommunications Academy by the ITU. This will operate as a brokerage service for distance learning courses. Once established, the Academy is to be self-financed through a fee payable by every course participant. The Academy aims to create a cooperative network of partners by pooling existing resources in universities, training institutes, financing bodies, governments, regional organizations and telecommunications operators, and has as its goal the promotion of training and human resources development in developing countries.
- In the Internet area, the Internet Society (ISOC) runs an annual developing countries training workshop where in-depth training is given to participants financed by ISOC fund-raising from the private sector. Over 100 Africans were trained at each of the last two workshops. The UNDP's Sustainable Development Network Programme (SDNP) and USAID's Leland initiative have also trained significant numbers of network technicians.
- In six Francophone countries of sub-Saharan Africa, there is a plan to create training centers and courses for technical capacity building. The plan comes from a joint project by the United Nations Institute for Training and Research (UNITAR) and France's Organization for Scientific and Technical Research Overseas (ORSTOM is its French acronym). The Cameroon center has financial support from the World Bank's InfoDev fund, ORSTOM, ACCT and others. Funds are being sought for similar centers in Côte d'Ivoire, Sénégal, Burkina-Faso, Benin, and Mali. At the Cameroon center a network engineering course is now being run regularly.
- An Internet training programme has been established for institutes, schools and other agencies of higher learning in Francophone and Lusophone sub-Saharan African countries. It is called Internet pour les Ecoles Inter-Etat d'Afrique de l'Ouest et du Centre.
- The Commonwealth Secretariat has established COMNET-IT in Malta to support ICTs in Commonwealth developing countries and provide scholarships for postgraduate degrees in computer science.

Proposed ICT human resources development activities that have attracted attention include:

- Creating awareness-raising programmes to improve public understanding of the application of IT, with cooperation from the public

and private media, and publicize government use of IT.

- Ensuring that all educational institutions have full Internet access, particularly for University students who are often barred from using the campus Internet service due to lack of facilities.
- Developing training programmes in rural areas to teach basic infrastructure maintenance skills.
- Establishing 'centres of excellence or specialization' to train policy makers, network operators and users in government and the private sector; providing opportunities for advanced training at existing regional centres of excellence; and conducting seasonal outreach and distance-learning programmes to strengthen national centres. This can help to overcome the problems that centres of excellence are expensive to maintain, the perception that high-quality training can only be obtained outside the region, and the difficulty in some countries to attract good students in sufficient numbers to justify expenditures. ■

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Paths Beyond Connectivity:

EXPERIENCE FROM LATIN AMERICA AND THE CARIBBEAN

by RICARDO GÓMEZ, JULIANA MARTÍNEZ & KATHERINE REILLY

For the Internet to contribute to social development, it is not enough just to provide connectivity. Also required are public policy changes, improved evaluation, sharing of knowledge generation and information, and more equitable access and use by different social groups. Paths which civil society organizations can pursue to these ends are outlined from experience in Latin America and the Caribbean by three authors: Ricardo Gómez, Ph.D., Senior Program Specialist, International Development Research Centre (IDRC), Canada; Juliana Martínez, Ph.D., Policy Researcher, Fundación Acceso, Costa Rica; and Katherine Reilly, IDRC Research Award Recipient, Fundación Acceso; with contributions by the Acceso and members of the Pan Asia Network (PAN).

IN THE PAST FOUR YEARS, Canada's International Development Research Center (IDRC) has supported over 50 projects to research how the Internet can be used to serve human development[1]. In spring 2001, some lessons and ideas that emerged were synthesized in a publication, "Internet...Why? And what for?"[2] Unlike other ICT studies, this synthesis is grounded in current practices and shows the benefits of scaling up the experiences of Latin American and Caribbean civil society organizations (CSOs) in information and communication technologies for development (ICT4D). This article builds on that experience, analyzes challenges presented by the current euphoria about using the Internet for development, and traces paths toward meaningful use and social appropriation of ICTs for human development.

A SOCIAL VISION OF ICTs FOR DEVELOPMENT

Human development is more than economic growth. It involves the realization of human potential in all its dimensions, the strengthening of democracy with social justice, and the promotion of economic prosperity in conditions of social equity. In these terms, human development involves targeting complex balances and compromises between social, political and economic goals. Thus, ICT4D refers to the role that information and communication technologies can play in pursuing an interrelated set of activities for human development.

Contrary to dominant views that are colored by euphoria, evidence in Latin America and the Caribbean indicates that, although ICTs can play a role in human development, it is a rather modest one. The "digital divide", usually referring to inequities in access to new ICTs, especially the Internet, is not a cause but a manifestation of existing social, economic and political divides at the local, national and global levels. Targeting the digital divide will not, by itself, help disadvantaged peoples or communities to improve their living conditions, move out of poverty, or get more equitable access to goods and services.

In decades past, the international development community was enamored with microenterprises, community radio, the link between education and the labor market, or the promise of agro-industrial ventures. In similar fashion, today's hopes and expectations are placed on connecting people to the Internet. Governments and international agencies are focusing their attention in this direction (see, for instance, the G8 declaration in Okinawa in 2000, or the Organization of American States declaration in Quebec City in 2001).[3]

Many of the current initiatives focus on setting up infrastructure and providing access to ICT tools, without any further interaction with local needs or activities. In some cases, containers loaded with equipment are set up in marginal neighborhoods with the hope that people will come and use them, an approach that has been humorously referred to as "link 'em and leave 'em". However, although important, connectivity alone does not make ICTs useful for development. If ICTs are to contribute to development, then we must look beyond the emphasis on connectivity to more comprehensive solutions.

ICTs are not a magic solution. As tools, they can either increase or reduce existing inequities, whether social, economic or political. They can strengthen antidemocratic, corrupt or sectarian movements, and they can easily result in effects contrary to human development. Rather than assuming that connectivity programs will automatically bring about human development, we need to rephrase the questions relating ICTs and development. For example:

- Under what conditions can ICTs make meaningful contributions to

improve the quality of social services such as education or health care?

- What kind of enabling environments are needed for ICTs to help promote economic prosperity, create better employment or redistribute wealth?
- How can democracy and social justice be strengthened by the use of ICTs?

It is important to emphasize that the Internet is one of many tools that can contribute to transforming reality and bringing about human development. Development activities need to start by identifying how that reality should be changed, and then determine if and how ICTs can contribute. Then ICT4D activities need to determine, in terms of the community at hand, what type of access and use is most appropriate to the realization of that change.

TOWARD A SOCIAL VISION OF ICT4D

"Information and communication technology" is not a magic formula that will turn copper into gold, nor 0's and 1's into democracy, participation and development. Democracy and participation are necessary preconditions for the effective application of ICTs to development. The use and appropriation of ICTs needs to be realized in an ethic of solidarity, reciprocity and enthusiasm, and should be seeded in the soil of our deepest human values.

Connectivity is only part of the challenge, and not necessarily the most difficult part. ICT4D programs need to move beyond connectivity: they need to draw on the potential of enabling environments, develop practices to minimize risks, and take advantage of the promising results of using ICTs for human development. Moreover, provided existing positive enabling environments, ICTs are not a necessary nor a sufficient condition for development, but should be used in combination with other development efforts. ICT4D policies cannot just focus upon ICTs, but should focus on how ICTs can contribute to meeting people's needs, whatever these are: health, nutrition, housing, recreation, political voice, personal empowerment, etc.

Information and communication technology (ICT) is not a magic formula that will turn copper into gold, nor 0's and 1's into democracy, participation and development.

Beyond connectivity. Moving beyond connectivity requires equitable access to ICTs, meaningful use, and social appropriation. Equitable access involves affordable physical access to the Internet, and basic technical training to use a computer, both its hardware and software, irrespective of sex, class, language, etc. Meaningful use signifies the ability to effectively use Internet resources, combine them with other communication technologies (such as radio), access online information,

exchange ideas in one's own language, and produce contents if desired. Social appropriation occurs when the Internet and online information become tools to solve a local problem or to positively transform a local reality.[4]

Enabling environments. ICTs can positively affect the reality of a person, group or organization most effectively and efficiently when they contribute to an existing positive social practice. Thus, people, communities and organizations need to have a strategic vision of communications that incorporates ICTs into planning for larger goals. And the promotion of ICTs and development of strategic visions should be based on democratic and participatory processes. If social appropriation is the turning point at which connectivity starts to make a real difference to the living conditions of people, then programs and policies need to create enabling conditions for appropriation. In this sense, "trickle down" connectivity will not lead to development.

Minimizing risks. There are risks in any new enterprise, and the introduction of ICTs for development is no exception. The Internet can just as easily reinforce or reproduce existing inequalities as help develop strategies to cope with them. In addition, our incipient knowledge of how to manage the quantity and quality of data transacted online has produced information inundation which can lead to paralysis, alienation from the real world, the fragmentation of knowledge, and homogenization through the imposition of dominant world views.

Promising results. Despite the above, promising results have also been observed. The Internet allows formerly isolated groups to participate in a larger world; it provides the possibility of new forms of collaborative work; and, it has the capacity to strengthen multiple voices in a world of diversity and pluralism.

These ideas are drawn from the results of a number of research projects supported by IDRC in Latin American and Caribbean. They highlight challenges that need to be faced if ICTs are to make meaningful contributions to development in the future. For example, ICT4D solutions must be cost-effective, appropriate for people, and complementary to sustainable development. Strategies must also avoid homogenization on the one hand, and inundation on the other, and they must be gender-sensitive. A variety of information should be widely and democratically available, and people should be empowered to turn it into knowledge that meets their own needs.

The Internet can just as easily reinforce or reproduce existing inequalities as help develop strategies to cope with them.

We have learnt that there is no magic bullet. The question is, then, how do we get onto a path that takes us beyond

connectivity and makes ICTs useful for human development?

THE ROLE OF CIVIL SOCIETY ON THE PATH BEYOND CONNECTIVITY

There are at least three primary issues that mark a difference between simply promoting ICTs for their own good and promoting ICTs for human development. In order to pursue a social vision, further research and practice are urgently needed on:

- formulation of relevant public policy;
- new approaches to knowledge, learning and evaluation; and
- sensitive approaches to differential access, use and appropriation of ICTs.

Transforming public policy

Just as ICT4D should go beyond connectivity, public policy aimed at fostering ICT4D should go beyond telecommunications policy, to encompass education, health, housing, and any other public policy areas related to the well-being of the population. In other words, if ICTs are to serve development, they will need to be applied to specific areas of public policy and social intervention. A primary challenge is precisely to establish how to make ICTs relevant tools for making public policies more responsive to the needs of the population.

Many governments in Latin America and the Caribbean are designing and implementing ICT policies within closed circles of experts that include policy advisors and private business interests. The private sector has been active in persuading governments to incorporate the Internet into their agendas (particularly for the privatization of telecommunications and commercial applications of ICTs). To date, civil society organizations (CSOs) involved in ICT4D activities in the region have hardly been involved in Internet-related decision making in public policy. Among other reasons, this is because they lack a clear agenda for public policy advocacy and the strategy and political leverage required to promote a social vision of ICTs in the policymaking agenda.

At the same time, grass-roots development efforts involving ICT4D are starting to be confronted by large-scale government programs that sometimes help to promote, but frequently tend to take priority over, local goals, lessons and priorities. These public programs are not always informed by lessons drawn from already existing local practices. At the same time, legitimate yet biased business interests influence public efforts. In the experience of Latin America and the Caribbean, we have identified the *fundamental need to build on and scale up from existing local, grass roots and civil society development activities, experiences and knowledge*. This will help to bridge the skills and experience of local groups with the resources and large-scale actions of policymakers and business interests, which otherwise try to reinvent the wheel, sadly, with great waste of

resources and often to the detriment of existing local initiatives.

Scaling up is important for local, community level CSOs. They have the vision and the experience to work on a small scale, yet not necessarily the mandate or resources to scale up what they have learned, in order to increase the scope and impact of ICT4D. On the other hand, these organizations have pertinent advice for governments, which often have the resources but not necessarily the skills and experience required to foster ICT4D.

With mutual respect and will, collaboration between sectors can take place in spite of different visions of how ICTs can contribute to human development. Public, private and civil society sectors do indeed have different expectations for ICTs. And, each sector comprises a variety of organizations, views and agendas. When possible, alliances with governments and/or businesses that are sensitive to a social vision of ICTs may help CSOs advance their agendas, provided there is some common ground on which to build them.

For CSOs, participating in the transformation of public policy will require:

A clear agenda, that identifies specifically which components of the policy cycle are prioritized (e.g., problem definition, policy implementation, monitoring and evaluation). Some organizations may be interested in using Internet to improve their capacity to control public policy (e.g., controlling compliance with social security). Others, may be interested in advocating the creation of new programs around ICTs (e.g., public telecentres). Additionally, clarifying the agenda involves setting priorities on what the Internet can do for people and organizations in different areas: from health, education and housing, to the use of ICTs to strengthen community organizations.

Informed strategies that carefully analyze and map the environment in order to identify all possible allies for the pursuit of complementary agendas, as well as stakeholders that may confront these agendas. This involves linking primary goals from the agenda (e.g., monitoring the implementation of ICTs in public schools) to specific means for achieving these goals (e.g., strengthening common visions within networks of CSOs). Additionally, developing informed strategies involves, whenever possible, strengthening alliances between governments, civil society and private sector. ICT4D policy is not always a win-win solution for all stakeholders. However, it can be. Finally, CSOs need to strengthen their political leverage to improve the outcomes of possible confrontations with powerful private business.

The participation of CSOs in public policy confronts various challenges. Governments do not always welcome or have mechanisms to channel participation. Participation is particularly absent at the problem definition stage, and in the generation of a variety of possible solutions. Policymakers frequently take

it for granted that the primary problem is lack of connectivity, and, as a result, solutions are limited to mechanisms for providing affordable connectivity. Most public initiatives take the position that once connectivity is (formally) available, people will spontaneously use the technology to improve their well-being and the quality of their life.

Agendas and strategies to transform public policy, and the resulting political leverage, will depend heavily on the specific ICT policy issue CSOs choose to pursue. For instance, the pursuit of a social vision of ICT4D may be different for women's groups than for environmental organizations. The former may target monitoring and evaluation of already existing ICT4D policy, while the latter may establish priorities for getting governments to define new problems and possible solutions.[5]

Evaluation, information sharing and generation of knowledge

The second issue is how to foster a better understanding of the application of these tools to support, and be supported by, learning, evaluation, knowledge and decision-making. For example, how can CSOs and local groups use monitoring and evaluation to generate better information and to facilitate learning? How can they improve the sharing and application of information, so that it can contribute to the generation of new knowledge to improve decision-making? One of the major challenges is precisely drawing a link between a social vision for the Internet and the development of new knowledge.

Information, the mainstay of the Internet, is one of the basic ingredients in the generation of knowledge. But just as information does not equal knowledge, access to more information does not imply the generation of new knowledge. In the words of Kemly Camacho of Fundación Acceso,

> *To reduce the digital divide, conditions need to be created for the least favored groups to have the capacity to create new knowledge through the use of the Internet, and reflect it in concrete applications that transform society.(Camacho, http://www.acceso.or.cr/publica)*

Thus, in terms of "knowledge", we can refer to equitable access as the knowledge required to confront all the issues that arise when one is considering the implementation of a new ICT. Appropriate use would imply knowing what one wants to do, and can do, with an ICT, as well as how to go about doing it. And, social appropriation implies that groups have the capacity to bring ICTs together with their experiences of the real world to generate new knowledge that can contribute to positive social, economic and political change.

Finally, not only information, but also the new knowledge that is generated through social appropriation of ICTs, needs to be documented, organized and shared. Of the several processes that can

be used to produce information and knowledge, monitoring, self-reflection and evaluation are seen as key since they should be a part of any such process. Evaluation is not just realized by outside auditors or just a tool for accountability. It is also a means to implement a local and/or personal culture of reflection and learning that will advance the state of knowledge about how to use ICTs as a tool to create positive social change. So, altogether, we could say that:

ICT tools and the generation of new knowledge for development

Access = knowledge *about* the tools
Use = knowledge *on* the tools
Appropriation = knowledge *from* the tools
Evaluation = *learning about the knowledge process*

These "knowledge elements" of a social vision of ICT4D are all interrelated. That is, one is not more important than another, and one does not necessarily precede another. For example, in order for the results of an evaluation process in one community to be appropriated by another community and turned into knowledge about how to deal with a real world situation, these evaluation results can be put on line, which in turn would require access. In order to achieve equitable access, meaningful use, and social appropriation, a process of reflection and learning about ICT4D is central.

The question is, then, how can CSOs help make this happen? There are several efforts that can be pursued which will help ensure that ICTs contribute to positive social change:

- Processes of evaluation, reflection and knowledge generation need to be developed for use by local communities so that they can access, use and appropriate ICTs (both socially and technically). For example, tools are needed for publishing, finding, interpreting and assimilating information, and for applying it to concrete, real-life experience.
- Taking into account existing social and organizational practices, appropriate methodologies are required to merge existing oral or printed knowledge with Internet resources.
- A strategic vision of communication is required to avoid the loss of traditional knowledge, facilitate the communication, distribution and uses of information, and to organize and evaluate the state of information and applied knowledge.
- Methodologies are required to produce and extract information out of the myriad of sources available, and to document and learn from project experiences and lessons for use in practice, advocacy and policy.

In addressing these needs, challenges include stimulating participation in knowledge activities, which involves,

besides pure motivation, moving beyond the generation of information, to finding solutions and reaching conclusions. Here we must be able to overcome 'bad habits', such as celebrating only success stories and covering up failures, treating learning as a luxury, or focusing on information storage over developing knowledge capacity (Michael Edwards). These are questions around the publication of information (relevant to each and every actor—CSOs, government or private interests), touching on areas such as withholding information, accountability, access, ethics, and democracy. There are further questions around how to avoid the misapplication of information and knowledge; how to make locally produced information, locally realized evaluations, and local knowledge more credible and respected in the eyes of decision makers; and how to deal with problems in locating information, information explosion, information anarchy, information scatter, and information myopia (ECDPM, www.oneworld.org/ecdpm/pubs/infobrief3_gb.htm).

Despite some initial efforts supported by IDRC in the region[6], more work still needs to be done in this area. In particular, the use of ICTs to facilitate access to information and its appropriation for the generation of new knowledge requires the development of new skills, visions, strategies, policies, and processes for CSOs—at the level of the individual and the organization, and within sectors, over regions, and between organizations.

Sensitive approaches to differential access, use and appropriation of ICTs

ICTs have emerged in a scenario pervaded by inequities and hierarchies: between rich and poor, men and women, people of differing abilities, young and old, white and other ethnic groups, just to mention a few. Differential access, use and appropriation of ICTs illustrate the challenges faced by CSOs in learning from evaluation and transforming public policy.

The differences and inequities between men and women run deep. Men and women have different perceptions and possibilities to access, use and appropriate ICTs. Men are expected to be rational, objective and dominant. Women are expected to be emotional, subjective and submissive. Moreover, male traits and practices are often culturally considered superior, or valued more highly than female traits. These fixed expectations, often called "gender-specific traits" or gender roles, pervade public and private life, and therefore impact on ICTs as well.

Just as ICTs alone will not overcome social inequality and bring about positive social change, ICTs by themselves will not help to overcome gender inequality. However, fostering equitable access, meaningful use and social appropriation that is sensitive to existing gender roles and inequities may help overcome existing hierarchical relations between men and women, as well as other unequal relations of power and resource distribution in society.

As Edith Adera from IDRC explains: *Women's need for information is usually based on their perceived gender roles and responsibilities as defined by society. This in turn affects how they use and respond to ICTs. As they tend to have less access to education and training, and those who do go on with education tend to stick to "socially-acceptable" or peer-group nontechnical streams, this automatically has an impact on continued gender differentials in access to and use of ICTs (Edith Adera, page 11).*

Access, use and appropriation of ICTs are often seen as notions that involve similar tasks for all social groups. If ICTs are going to contribute to social transformation, working towards equitable access, meaningful use and social appropriation of ICTs requires more comprehensive efforts, not merely "technical" ones.

The incorporation of a gender perspective into ICT4D has mostly revolved around emphasizing the access differential between women and men. Work on gender and ICT4D is, for the most part, examined from a connectivity perspective and little has been done that ventures beyond connectivity.[7] Some strategies to confront this challenge involve examining access, use and appropriation of ICTs beyond sex-disaggregated data. It is also important to analyze the design, content and objectives of an ICT project from a gender perspective. Analysis of ICT inequalities based on sex can be broadened by taking into consideration gender as a function of the power that intersects other social differences such as class, age and ethnicity.

We still need to learn more about what it means to pursue meaningful use and social appropriation, not only in terms of differences between men and women, but also in terms of promoting gender equity. We need, for instance, to respond to questions concerning control, quality of use and appropriation of available resources by men and women, as well as how ICTs can reinforce or contribute to overcoming entrenched gender roles.

Similar challenges are faced in terms of the pervasive social hierarchies among disadvantaged social groups. For instance, work conducted in Ecuador has motivated street children to go back to school, engage in economic activities, and pursue an ethic of solidarity. Of course, there is no magic solution: change takes time, and success can depend on tasks that donors are not always ready to support, such as empowerment and psychological support. However, there have been some visible achievements in this area.

Two things are required to advance sensitive approaches to differential access, use and appropriation of ICTs. Positive experiences need to be communicated so as to advance the starting positions of others and avoid unnecessary repetition of errors and reasons for failure. This will in turn require the incorporation of these concerns into evaluation and learning strategies, as well as policymaking.

CONCLUSIONS

Pushing the limits of ICT for development means taking the difficult path beyond connectivity in order to promote equitable access, meaningful use and social appropriation of ICTs to transform reality. This poses the challenge of transforming public policies, strengthening learning and evaluation, and transforming the inequities in society.

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Several critical and interrelated areas that need to be strengthened in the use of ICTs for human development are:

- Collaboration between private, public and civil society, with a clear agenda and an informed strategy to build on and draw from local knowledge, experiences and priorities;
- Strengthening of new skills, visions, strategies and processes for CSOs to become actively engaged in transforming public policy;
- Development of methodologies to produce, extract and adapt relevant information and turn it into useful knowledge for development;
- Documentation, analysis and communication of both positive and negative experiences, lessons and results in ICT4D activities and programs.

The ideas presented here are based on ongoing practice and work, and they already live outside the page. However, will these ideas impact other people involved in ICT4D, such as policymakers, scholars and experts? Below, we point to some practical examples of the kind of efforts we expect to see in the near future, as a result of the projects and ideas presented here:

- Policymakers and connectivity programs need to allocate resources to improving equitable access to ICT, but also to improving meaningful use and social appropriation; (e.g., if you have $100, do not invest it all in access to connectivity and wait for use and appropriation efforts to happen later or spontaneously!).
- Evaluation and action needs to identify challenges faced by individuals, organizations, communities and countries in improving not just equitable access, but also meaningful use and social appropriation (e.g., public telecentres will set up monitoring systems to learn how people are using the technology and for what), and help establish strategies to turn online information into local knowledge about how to directly

address these challenges.

- Policymakers, researchers, practitioners and other actors involved in pursuing ICT4D programs need to focus on understanding and overcoming group differentials and social inequities (e.g., due to gender roles; ethnicity, age, etc).

CSOs confront both the challenge and the opportunity of conducting small-scale efforts to overcome inequities and social hierarchies in the access, use and appropriation of ICTs, transform public policy and learn from evaluation. However, CSOs by themselves cannot turn ICTs into powerful tools for development. Broader coalitions are needed, working in collaboration with public and private sectors wherever possible, with clear agendas and strategies to take connectivity off the beaten track. ■

Notes

[1] Details about the different projects can be found at www.idrc.ca/pan.

[2] "Internet...why? And what for?" is available in English, French and Spanish at www.idrc.ca/pan/pppp and www.acceso.or.cr/pppp.

[3] Okinawa Declaration: www.g8kyushu-okinawa.go.jp/e/documents/itl.html; Quebec Declaration: http://www.americascanada.org/eventsummit/declarations/connect-e.asp.

[4] For further elaboration on access, use and appropriation, see Camacho, 2001 http://www.acceso.or.cr/publica.

[5] IDRC partners are pursuing research activities to confront some of these challenges in the Americas. For example, ongoing research seeks to observe and establish the social impact of the Internet in Latin America and the Caribbean to inform policymakers (OLISTICA, www.funredes.org/olistica), or monitors what governments are doing or intend to do in the region concerning Internet policy (Internet Policy Monitor, www.apc.org). A third line of research seeks to strengthen the capacities CSOs to advocate the incorporation of the Internet in the public policies they consider socially relevant, in order to make these policies more responsive to the needs of the people (www.acceso.or.cr).

[6] The Telecentre Network project (TELELAC) has experimented with the use of storytelling as an affordable and fruitful method to capture and transmit experiences and local knowledge. TELELAC, MISTICA and the Web Community of Social Movements created virtual workspaces for "communities of practice" to come together and share information resources and knowledge (www.tele-centros.org; www.funredes.org/mistica; www.movimientos.org).

[7] A notable exception is the APC Women's Network Support Program, www.apcwomen.org.

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Creating a Knowledge-Based Labor Force in Asia

by MEHEROO JUSSAWALLA AND RANA HASAN

Education has especially high value when the economic and technological environment is changing rapidly, as is happening in countries where information technology and trade liberalization have been introduced. The question is how to design policies and funding strategies for education and training in this environment so as to achieve the greatest improvements in productivity and labor force income. Providing insights on the issue from Asian experience are Meheroo Jussawalla, Senior Fellow Emeritus, and Rana Hasan, Fellow, from the East-West Center in Honolulu, Hawaii.

INTRODUCTION

The problem of leveraging human capital to spur economic growth in less developed countries (LDCs) has captured the attention of international policymakers due to the rapid transformation of social and economic organizations induced by globalization and the dynamism of information technology (IT). According to some observers, these phenomena have the potential to exacerbate global inequalities and make the specter of social unrest more threatening. For instance, Robert Wade of the London School of Economics argues that income inequality is growing faster around the

world as a result of globalization, and that governments should respond (*The Economist*, April 28, 2001). Similarly, in July 2000, the G8 countries' ministers meeting in Okinawa took note of this inequality, ascribed it to the Digital Divide, and in their "Okinawa Charter" urged the affluent countries to help the developing ones bridge it with funds and technology transfers.

Whether globalization is raising inequality, and if so through what channels it does so, are issues that need to be studied very carefully, using representative household level data from all around the world. Such an effort is indeed underway among development scholars and at development agencies such as the World Bank and UNIDO. In the meantime, it is difficult to deny that much more effort is needed in building skills and knowledge among the broad categories of workers in developing countries. This has been true for quite sometime, especially in a world where new technologies may be increasingly biased toward skilled workers. This paper focuses on the challenges that individual countries in Asia face as they attempt to build these skills and knowledge among their citizens.

HUMAN CAPITAL ACCUMULATION AND GROWTH*

A report published by the OECD in May 2001, *The Well-Being of Nations: The Role of Human and Social Capital*, argues that better education leads to better health and to the accumulation of human and social capital, which does not get depleted as incomes increase. It asserts that human capital must be increased with education and training. This is the path which has been followed in several Asian countries, particularly in the Asian "Tigers." Their rapid growth has been facilitated by an effective strategy of human resource development (HRD) based on improved education and better resources for health information and treatment. The major expansion they achieved in education and health services took place in the context of an economic environment which rewarded education.

Reviewing the theoretical and empirical linkages between human capital accumulation and economic growth will help clarify the key lessons for an effective HRD strategy. It has long been accepted that the accumulation of human capital is essential for economic growth. In fact, in the context of growth theory, it is well known that a strategy of development based only on accumulation of physical capital and undifferentiated labor will soon run into diminishing returns (Krugman, 1994). For growth to be sustained, it is essential that there be technological progress. But contrary to what many early economic growth models assumed (for example, Solow, 1956, 1957), technological progress does not fall like "manna from

* This section and the next draw upon Deolalikar, Hasan, Khan and Quibria (1997).

heaven". Instead, it is the outcome of human endeavor and depends critically on the quality of human resources. This is obviously true when an economy develops new technologies on its own. But it is also true for later comers to development, because even adopting new technologies developed elsewhere requires ingenuity and skills.

Investing in human capital to augment the quality of human resources takes many forms. At the most basic level, for instance, a number of studies have noted that inadequate calorie intake and poor nutrition more generally will have an adverse impact on the physical and cognitive development of individuals, for example, Strauss, 1986 and Deolalikar, 1988.

Of course, the productivity effects of nutrition and health are strongest at low levels of nutrition and income. At higher levels of income—and thus higher levels of nutrition—they level off, as noted by Strauss, 1986. For improving productivity further, it is essential to equip workers with knowledge and skills. For this, education plays a crucial role.

Difficult as it is to expand the supply of education in poor countries, as will be described in greater detail below, it is unfortunately still not enough by itself to translate into ultimately better standards of living. Why is this? A casual look at the returns from education in developing and developed countries suggests that educated workers certainly earn more. For example, some estimates for Asia indicate that private rates of return from schooling can be as high as 31 percent (Psacharopoulos, 1988). These returns need not translate into improvements in productivity and technological capability in one-to-one fashion. Some of the private returns may reflect factors other than schooling.

One such factor is that the number of school years completed provides a credential that may have nothing to do with productivity and technological capability. In India, for instance, a number of public sector jobs require candidates to have passed a national examination at the end of tenth grade. Since public sector jobs tend to be relatively well-paying ones, a high correlation between having passed the tenth grade and incomes cannot be interpreted to mean that instruction in the tenth grade somehow magically raises individuals' productivity! As Spence (1976) has argued, education is often used as a screening device by employers to distinguish between low-ability individuals and those of high ability who go through school more easily.

Thus, the screening and credentialism involved with education may mean that estimated private rates of return to education are not as high as some people argue. However, these should certainly not be considered the only factors that drive the returns to education. Carefully conducted research in both developed as well as developing countries has demonstrated that schooling does raise cognitive abilities (for example, Alderman,

Behrman, Ross, and Sabot, 1996, Ashenfelter and Krueger, 1994).

Moreover, there is growing evidence that the returns to education are not a given constant, that education is particularly important in settings where the economic and technological environment changes rapidly, and that education facilitates the adoption of new tools and technologies (Shultz, 1975). These findings are true in both agricultural and industrial settings:

- In agriculture, for example, Foster and Rosenzweig (1996) use data from Indian rural households, farming inputs, and crop yields, to shed light on the importance of education in India's experience with the green revolution. Controlling for soil quality and other factors, they find that farmers with a primary education were typically more productive than their uneducated counterparts, but not too much more. However, in regions especially conducive to cultivation of new high-yielding seed varieties, the productivity of primary educated farmers was as much as 46 percent higher than uneducated ones. Put differently, Foster and Rosenzweig find that the benefits of education are strongest in the context of changing circumstances.
- In the industrial sector, research yields similar findings. Tan and Batra (1996), for instance, note that training programs in Taiwanese firms had the biggest impact on productivity of skilled rather than unskilled workers. Skilled workers who received training had wages 54 percent higher than similar workers in firms that didn't invest in training, and the corresponding wage premium for training among unskilled workers was only about 15 percent.

INVESTING IN A KNOWLEDGE-BASED LABOR FORCE: WHERE DOES DEVELOPING ASIA STAND?

The above suggests that while an expansion in health and education services is important in the context of economic growth, the economic context in which these services are provided is also important. Human resource development policy must be designed with an appreciation of individual country characteristics, and a knowledge-based labor force will vary by country. A "one size fits all policy" may not work and, worse, lead to a waste of scarce resources. It is thus important to identify some of the key indicators of the state of HRD in various individual economies and relate these to the context-specific challenge for these economies. The following section does this for east, southeast and south Asian countries.

Challenges in Basic Education

Adult literacy has been largely conquered or is close to being conquered by most countries in east and southeast Asia, as table 1 reveals. This is far from

Table 1—BASIC STATISTICS ON LITERACY AND ENROLLMENT RATES (PERCENT)

Subregion and country	Adult literacy rate 1995	Gross enrollment rate Primary 1996	Secondary 1996	Tertiary 1996
Newly industrialized economies				
Hong Kong	92	94*	73*	28*
Korea (Republic of)	97	94	102	60
Singapore	91	101*	67*	39*
Taiwan	—	100*	88**	21**
Other East Asian countries				
People's Republic of China	82	120	71	6
Cambodia	65	109	28	1
Indonesia	84	115	52	11
Lao PDR	57	111	29	3
Malaysia	84	91	62	11
Myanmar	83	100	35	6
Philippines	95	118	79	35
Thailand	94	88	57	21
Viet Nam	94	—	—	—
South Asia				
Bangladesh	38	84	19	6
India	52	101	49	7
Nepal	28	105	37	5
Pakistan	38	81	30	4
Sri Lanka	90	109	75	5

— *Not available.A22*

Notes: *Closest year available*

Sources: *Asian Development Bank (2000); UNESCO (1999); World Bank, 1997a.*
** *Lewin (1997)*

true in major south Asian economies (Bangladesh, India, Nepal, and Pakistan), where adult literacy rates remain quite low, the exception being Sri Lanka.

Fortunately, the gross enrollment rates in south Asia are now fairly high, as the second column in table 1 shows, and are somewhat comparable to those found in southeast Asia. But these numbers mask some key problems, especially in south Asia and parts of Indochina. One problem is access to education by children in low-income groups. As Deolalikar (1997) reports, for instance, the gross primary school enrollment rate for children from the wealthiest 20 percent of families is, respectively, 35 and 43 percent greater than for the poorest 20 percent in Cambodia and Laos. Access to education is also highly differential in some cases across gender. Thus, in India the gross primary school enrollment rate of girls is 80 percent that of boys, while in Pakistan the figure is only 50 percent (Deolalikar, 1997).

Enrollment rates may also not tell us much about the quality of education being provided. Quality can be quite hard to measure systematically across countries and over meaningfully large samples of children, but some indirect measures can help shed light. In particular, while high rates of dropout may reflect the need of poor parents to work, they can also reflect a poor quality of education. Case studies from rural areas in north India and elsewhere confirm that this is the case (Dreze and Gazdar, 1997, Hanushek, 1995). Deolalikar (1997) notes that, of the cohort of children who enter primary school in countries such as Bangladesh, Pakistan, Nepal, and Laos, only about half complete grade 6.

The lack of primary education of sufficiently high quality in much of south Asia and parts of Indochina is an issue of considerable concern for these economies. In particular, these countries have made significant efforts to open up their economies in recent years. Conventional wisdom based on standard notions of comparative advantage suggests that opening up is likely to provide greater opportunities for the typical worker in labor-abundant countries. However, recent studies suggest that those with very limited education and skills may be unable to take advantage of the opportunities that trade liberalization is throwing up (Robbins, 1996; Wood, 1997).

Workers with very limited education and skills may be unable to take advantage of the opportunities that trade liberalization is throwing up — new technologies may be increasingly biased toward skilled workers.

Why should the predictions of standard trade theory—in this case, the so-called Stolper-Samuelson effects—not

be borne out in the data? While more research is needed on this issue, one possibility is that new technologies have increasingly become biased toward skilled workers. Thus, when a developing country opens to trade, the concomitant inflows of technology that take place create the most significant opportunities for the skilled rather than the unskilled.

Clearly, more research is needed to confirm that this is happening. In particular, evidence from Asia is still a little sketchy. But it is interesting to note that a very recent study for Indonesia finds that trade liberalization in that country has been associated with a lessening of wage inequality between the skilled and unskilled (Suryahadai, 2001). While this is consistent with conventional wisdom, and thus may have been caused by trade, it should be noted that the study also finds that the supply of educated workers has risen sharply.

In other words, while relative wage inequality may have declined on account of an increase in the demand for unskilled labor induced by trade, it is also possible that the decline resulted from an increase in the relative supply of skilled workers. Seen in this light, the Indonesian study highlights the importance of expanding the supply of education in the context of a dynamic economic environment.

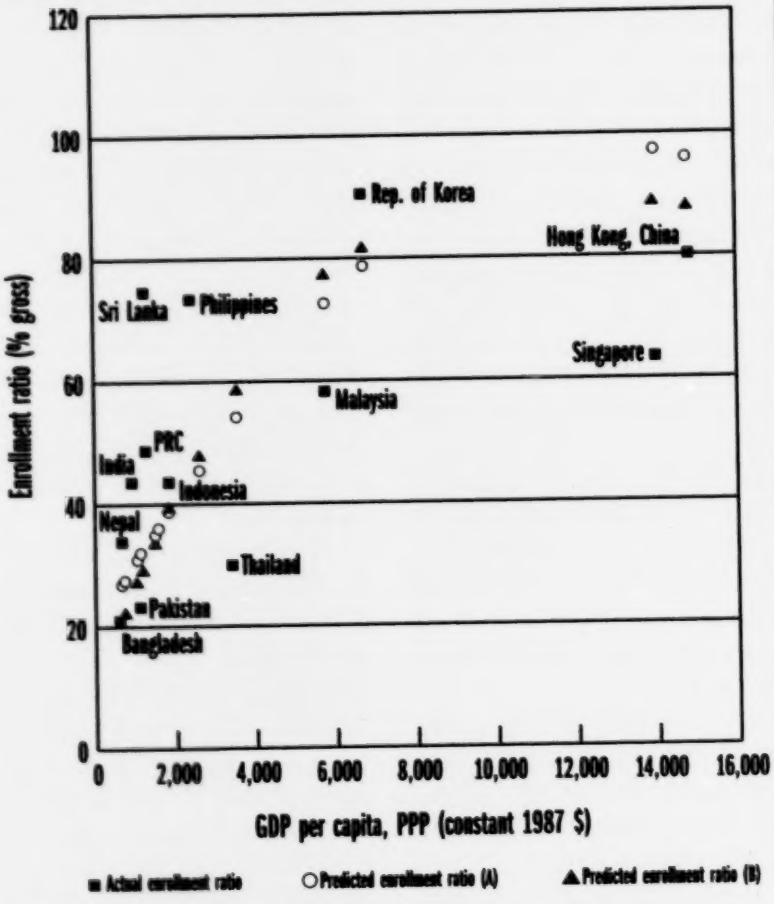
Challenges at Higher Levels of Education

Enrollment rates at secondary and especially tertiary levels display much more variation across countries. To a large extent this is natural and reflects the different stages of economic development across countries as revealed in figures 1 and 2 (from Deolalikar, Hasan, Khan, and Quibria, 1997). But there are some notable exceptions to this relationship, such as the large and negative differences between actual and predicted enrollment rates for such high-performing economies as Hong Kong, Malaysia, Singapore, and Thailand at the secondary level, and for Hong Kong and Singapore at the tertiary level. In contrast, enrollment rates at secondary and tertiary levels for Philippines and secondary level for Sri Lanka are significantly higher than one would expect given their levels of economic development.

The relatively poor performance of the middle (Malaysia and Thailand) and high-income economies (Hong Kong and Singapore) suggests cause for concern in these economies. As argued earlier, the contribution of education varies by context. Higher-income economies are more likely to have an economic structure which demands a higher proportion of better educated individuals than lower-income economies. Thus, for these economies to move up the value chain of production, greater efforts to spread higher education more broadly than they have been doing would seem to be key challenges.

While part of the challenge for these middle and high-income economies of Asia is in expanding the supply of good quality education, this is by no means

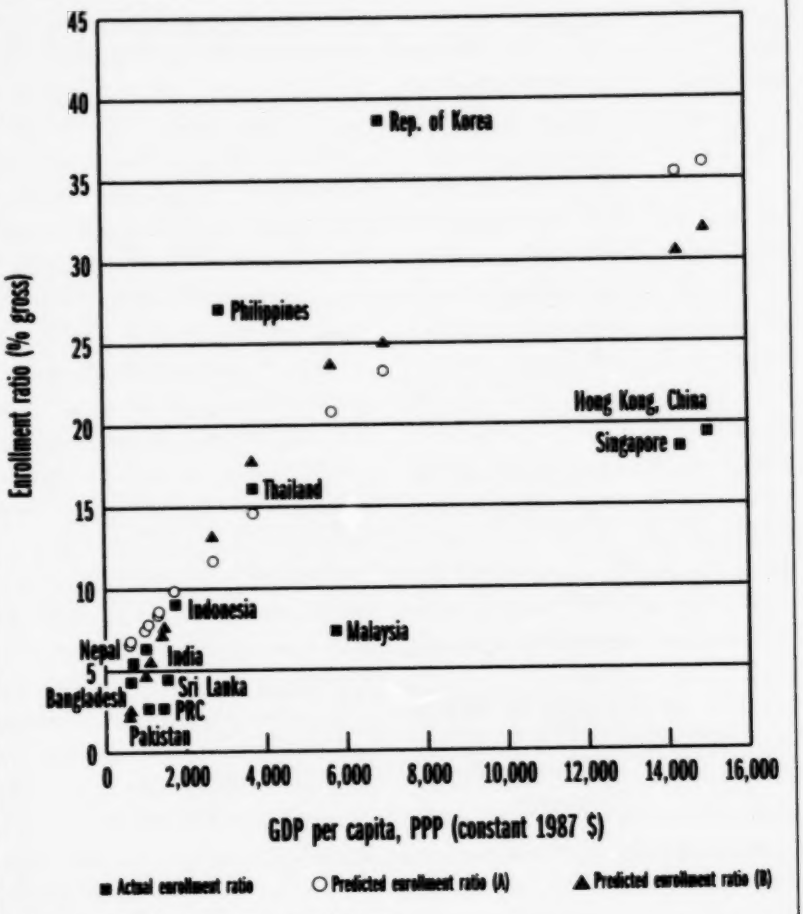
Figure 1—ACTUAL AND PREDICTED ENROLLMENT RATIOS (SECONDARY EDUCATION)



Source: *Deolalikar, Hasan, Khan, Quibria (1997)*

enough. Training students well is one thing. Making use of this training is another. Unfortunately, there are all too many cases in Asia of well-trained students in engineering or science switching over to positions in government bureaucracies. This seems to be especially true in south Asia and India. Murphy, Schliefer and Vishny (1991) give an insightful answer. They argue that talent and education are drawn towards entrepreneurial activities when policies and institutions allow people to organize firms with ease and retain their profits. However, when

Figure 2—ACTUAL AND PREDICTED ENROLLMENT RATIOS (TERTIARY EDUCATION)



Source: *Deolalikar, Hasan, Khan, Quibria (1997)*

policies and institutions encourage rent-seeking activities, the talented and educated are drawn to these.

To some extent, the problem of well-trained students being drawn to government bureaucracies is being alleviated by the expansion of the role of the market. In south Asia where government licensing laws and other aspects of industrial regulation seem to have encouraged rent-seeking behavior to an unusually high degree, a more deregulated market has increased opportunities outside the public sector. Nevertheless, markets on

Table 2—R&D EXPENDITURES AS A PERCENT OF GNP SELECTED ASIAN AND DEVELOPED COUNTRIES (PERCENT)

Country	R&D/GNP
Developing Asia	
China	0.5*
Hong Kong	0.3*
India	0.8**
Indonesia	0.1*
Korea, Rep.	2.8**
Malaysia	0.4`
Philippines	0.2`
Thailand	0.2`
Developed Countries	
United States	2.5*
Japan	2.9**
France	2.4**
Germany	2.4``
Italy	1.1**
Portugal	0.6*
Spain	0.9**
Switzerland	2.8~

Notes: *=1995; **=1994; ``=1993; `=1992; and ~=1990
Source: *World Bank, 1997a.*

their own may undervalue the returns from the highest levels of education and training. Similarly, they may also undervalue the development of technological capability. Thus, activities such as R&D may be undersupplied.

Table 2 displays R&D spending as a percentage of GNP for a cross-section of developing Asian countries and selected developed countries. The data clearly reveal that the more dynamic southeast Asian economies do not invest as much in technology-related activities as would be suggested by their higher incomes. For example, R&D expenditures in Indonesia, Malaysia, the Philippines,

and Thailand are much less than those of India or Pakistan. While part of this reflects the R&D conducted in south Asian countries' military complexes, this is not all that is at work. To some extent, these middle-income southeast Asian economies have neglected the development of local technological capabilities.

An illustration from the Asian Development Outlook (1998) is telling. The illustration points to the "flying geese" pattern of industrial development in east and southeast Asia. It notes that while Thailand has done well in the past by taking on the production and export of light manufacturing goods from such countries as Korea and Taiwan, it is now having difficulty in making the jump to the next level of production—design cum manufacturing. At the same time, pressure for Thailand to make this jump has intensified with the increasing competition from the low-wage economies of Bangladesh, China, India, and Viet Nam that have opened up to the global economy more recently. Fundamentally, what constrains Thailand from making this jump is the lack of sufficient technological capability.

A similar pattern may also be found in the Philippines as Deolalikar *et al.* point out. The Philippines have been able to expand rapidly their exports of electronics—by about 37 percent per year during 1991-1996, when exports of textiles and garments increased by merely 8.2 percent. Unfortunately, the electronic exports have very low value added since the local firms are essentially involved in very simple assembly and testing activities. Thus, average local content in semiconductors—which accounted for 77 percent of total electronics exports in 1995—is only about 20 percent. In contrast, average local content in the production of semiconductors in Taiwan is as high as 75 percent (World Bank, 1997).

Paradoxically, the steep currency devaluations resulting from the financial crises in these countries during 1997-98 have given them a new lease of life in low value-added manufacturing activities. But this advantage is unlikely to continue in the medium term. Ultimately, the main challenge is to put in place a set of policies which not only turn out superior graduates in a variety of fields, but also encourage a pattern of industrial development which values the development of technological capability.

MEETING THE CHALLENGES OF DEVELOPING A KNOWLEDGE-BASED LABOR FORCE

How do Asia's economies go about meeting the challenge of developing a knowledge-based labor force? Clearly, the challenges are different not only across countries, but also across the various types of workers. This can clearly be seen for India, which has millions of illiterates—the unskilled workers—but also a group of "knowledge" workers that can compete with the best in the world, as in knowledge-based IT and biotechnology sectors. The issue is how to iden-

tify overall policies and strategies for the various components of the human resource infrastructure individually.

Reforming the Delivery of Education and Nurturing Technological Capability

The delivery of education at all levels needs to be improved. Similarly, technological capability needs to be nurtured. Yet resources—both monetary and administrative—are clearly scarce and priorities therefore need to be identified. The challenge is clearly formidable. Adherence to two general principles is particularly important. The first is to allocate public funds to the areas where the social returns are greatest and equity considerations most compelling. The second has to do with altering the institutional setting under which educational services are provided.

Regarding allocation of public funds, one of the most critical lessons for public policy from the East Asian "miracle" is the importance—from an efficiency and equity point of view—of funding publicly basic education in poor, developing economies. As is well known, the social returns from basic education often outstrip the private returns. For instance, more educated individuals make better health and fertility choices with obvious positive spillovers for society as a whole. The private returns to basic education can also be high—pecuniary or in terms of productivity—but paucity of incomes and a lack of assets to use as collateral can make the opportunity cost of attending school inordinately high for many children from poorer families, thereby perpetuating a cycle of illiteracy and poverty.

Public funding is often the only alternative. And yet countries in south Asia continue to devote a considerable part of the education budget to higher education. If it was the poor who were benefiting from these subsidies for higher education, the matter might be a little different. But the reality is that the chief beneficiaries of these subsidies are individuals with the ability to pay for these educational services. To make matters worse, many of the courses that students opt for have little value in the market place. Students end up taking these courses because they are provided virtually free and because of the problem of credentialism described earlier.

Training researchers and funding their research have high social returns, may not be rewarded by the private sector, and are likely to require public funding.

Of course, certain activities within higher education are likely to require public funding. These activities—such as those involving the training of researchers and the funding of their research—have high social returns and may not be rewarded by the private sec-

tor. A public subsidy here would be in order. A similar case for public funding could be made for some research activities outside of the education complex.

But the way finance is provided is important, too. Simply pushing funds to organizations without appropriate monitoring is likely to encourage waste and corruption. This is why it is critical to change the institutional setting in which education is provided (and research organizations are funded). In particular, greater decentralization and market orientation in the provision of education hold considerable promise for making educational systems more effective. The same is true for the funding of research organizations. Of course, decentralization is a complicated process (see Deolalikar *et al.*). But it may be the only way forward in a complicated world.

An Appropriate Economic Policy Framework

As noted earlier, expanding the supply of education in a stagnant economy is unlikely to bring much benefit to society. It is imperative that the workings of an economy put a value on education and skills at the same time that a concerted effort is made in expanding educational services, especially those of the higher levels. What types of economic policies can ensure that an economy values education and the development of technological capability? This is a difficult question to answer. However, comparative experience suggests that a balance between markets and public sector intervention must be made. Obsession with market failures can lead to too much government and "government failures" and vice-versa. Indeed, India prior to 1991 can be seen as an example of the former, while some of the transition economies—especially those of the former Soviet Union—can fit into the latter.

An approach which keeps an economy open to trade and foreign knowledge, but also encourages the private sector to strive to move up the value chain of production, is probably the most pragmatic course. At the same time, there will be failures in particular programs and policies. Thus, maintaining flexibility in terms of being able to monitor programs and modify them must be of the highest importance.

CONCLUDING REMARKS

In addition to these broad challenges, some countries of Asia also face some new challenges vis-à-vis the knowledge-based labor force. A key example is that of labor mobility and the possibility of a brain drain. While the notion of a brain drain is an old one, a confluence of events—such as an aging population among developed countries and thus the demand for workers from other countries—is making labor increasingly mobile. While this is not the place to debate the pros and cons of immigration from the point of view of the developing countries themselves, it may be noted that greater thought needs to be given to the issue of reimbursing developing countries for the resources they have devoted

to nurturing their human resources.

Certainly, workers do make remittances and thus benefit their home countries. But as argued above, many times the ones who leave are the ones on which the largest public resources have been expended. A case in point is the graduates of India's elite engineering colleges, where as much as US$10,000 may be spent in training students. Methods for recuperating these funds if students go abroad to work must be considered and put into place. More broadly, a system for taxing international flows of labor must be debated and considered, as Desai, Kapur and McHale (2000) argue.

Last but not least, the members of the ASEAN are diverse, but they are home to 500 million people with a combined GDP of $700 billion. If China, Japan, and South Korea are to be taken into account, the current GDP would be $7 trillion. The Internet holds vast possibilities of progress in business and economic development. Asia has made significant inroads into the world's Internet economy, which will top one trillion dollars by the end of 2001, rising from $197 billion in 2000. This means that the international division of labor has changed the entire scenario of economic development and training of human resources in these countries. For example, the Indian Institutes of Technology have contributed greatly to the skills used in software exports from India and led to the formation of renowned companies like WIPRO, which also trains the employees that are hired. It shows the lead taken by the private sector in the information technology revolution in Asia's developing countries. India and South Korea have developed a large market for the non-English usage of the Internet, but by and large most Asian countries use English for their Internet networks. This becomes a part of the training of the labor force in the race to secure a niche in the IT revolution.

Examining the use of wireless technology in low-income countries, we find that China has taken the lead, with 55 million subscribers in 2000 and an increase of 2 million subscribers every month. There are 20 million PCs in China that have Wireless Applications Protocol (WAP), which helps with wireless banking, sports scores access, stock quotations and ticket reservations for air and train travel. In Bangladesh, the Grameen Phone has now taken the place of the Grameen Bank, and free cell phones are being given on a cooperative basis to women who own their small cottage industries.

Despite these developments in opening access to information technology and the universal service goals of the WTO, half the world's population has never used a telephone. The digital dividend has to be actively sought and provided to the have-not societies. This is being done through the Okinawa Charter of 2000, signed by the G8 countries in Japan, and the Okinawa plan to close the divide through active participation of the affluent countries in providing free

services and training to the have-not nations. Connectivity for the common people is the adage being now used internationally. The essence of the IT-driven transformation is its power to help individuals and societies to use knowledge

Connectivity for the common people is the adage being now used internationally.

and ideas. As the Okinawa Charter puts it, "The principle of inclusion is to be adhered to, meaning thereby that universal access is available to everyone, everywhere to foster the free flow of information and knowledge to promote human development, mutual tolerance and respect for diversity." ■

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From Medieval to Modern Times: Information in the Arab World

by HAMID MOWLANA

The current "information revolution" has profound implications for Arab countries, opening up public dialogue, political discourse, social debate and even religious interpretation to wider circles. How can the new communication technologies also be used to encourage development that is sustainable and equitable, maintain the value of indigenous communication and cultural traditions, and strengthen national identity, while also fostering inter-Arab cooperation in an era of globalization? These are among the questions explored by Hamid Mowlana, Professor of International Relations and Director of the International Communication Program, School of International Service, American University, Washington, D.C.

A GROUP OF ARAB SCHOLARS and planners examined a number of futuristic world economic models developed by various western institutions over the past three decades (Abdalla *et al.*, 1983). They concluded that most of those models reflect the current structures of advanced industrial nations—without considering the special cultural and social dimensions of Arab countries. Among the models criticized in this way were the MIT model "Limits to Growth," the Leontief model of the world economy, the SARUM model constructed by the UK Department of Environment, and the Interfuture study commissioned by the Organization for Economic Cooperation and Development.

The same complaint was heard during the period of the debate on the New World Information and Communication Order (NWICO), carried out in United

Nations fora and in UNESCO (International Commission for the Study of Communication Problems, 1980).

On the whole, these models and debates were reluctant to address the Arab region as a distinct entity and totally disregarded its social, religious, and political realities and aspirations. For example, such models often do not take into account the unique universal nature of Islamic civilization under which medieval Arab culture, science, and technologies flourished. While the world models are too holistic and general with a specific bias, many Arab suggestions for alternative futures seem to be too nationalistic and narrow (Sardar, 1985).

Over the last two decades a host of international conferences have addressed communication and development in the Arab world. These ranged from the UNESCO supported "International Conference on New Communication Technologies" held in Algeria (1987), to the conference on the "Impact of the Information and Communication Revolution on Society and State in the Arab World," held in United Arab Emirates (1997). Also during this period, the international system and the Arab world have gone through profound political, economic, and technological changes, including the process of "globalization" with its information and technological implications. At the same time, a new information ecology has been created, integrating satellite communication technologies into digital-based systems of computer networks, heralding the expansion and the growth of the Internet.

The conundrum facing the Arab world is whether it can handle the "Information Revolution" better than the "Industrial Revolution"? What should be the role of information technologies in this process of rapid change? Whose version of the new world information and communication order are we supposed to construct? Should there be a new single world structure, based on a nation-state system as we have now? Or would that constitute too many orders in the field of free play? What should be the role of information technologies in this period of rapid change?

The international communication debates of the last two decades did not surpass the political and economic arena. Indeed, by the last decade of the twentieth century a new world information and communication order had emerged, not so much by the leaders of the developing world, but by the technological and economic imperatives of the developed countries. In the international context, the United States' effort to develop the so-called information superhighway under the National Information Infrastructure (NII) has been expanded and developed into the Global Information Infrastructure (GII) by the European Union as well as the Asia-Pacific region, and has been endorsed by the International Telecommunications Union (ITU).

What are the implications of this new order for the Arab information and communications infrastructure now and in the

future? What, then, can we say about the relations between the current information technologies and development in the Arab world? As background for that, let us first trace some of the early technological history, including Arab world contributions, which led to the present situation.

TECHNOLOGICAL HISTORY

We can identify three major breakthroughs or "revolutions" which marked stages in the technological history of the past 12,000 years. In each period there were significant changes in wealth and work which had profound impact on social, political, and economic aspects of human civilization. First came the Agricultural Revolution lasting from 10,000 B.C. to 1800 A.D., when land was the most important measure of property and labor. Next came the Industrial Revolution between about 1800 and 1950, when capital in the form of machinery and money was the predominant factor. Third is the Information Revolution beginning around 1950 and continuing in the present "post-industrial age."

However, what has been neglected in the discussion of these stages is the fact that of the three factors—land, capital, and information—it is information that has had the longest and most pervasive impact throughout history. Information in the form of skill and knowledge preceded capital formation, and in many ways characterizes all three stages. If we accept this assumption, it simply means that information and knowledge are not the exclusive property of industrialized society and that they predate and break the boundaries of Western epistemology, methodology, and philosophy.

An example is the large amount and wide variety of scientific information and knowledge produced in the Arab world during the early Islamic period prior to the Industrial Revolution. Vital new knowledge was generated in such sciences as medicine, mathematics, and astronomy, not to mention such fields as communication, transportation, navigation, literature, and philosophy. The work of three scholars from the medieval period between 900 and 1400 A.D. will serve to illustrate these contributions:

Information and knowledge are not the exclusive property of industrialized society.

- Al Haitham (965-1039) was a renowned physicist and one of the greatest investigators of optics and communication science of all time. His research and tabulation of corresponding angles of incidence and refraction of light passing from one medium to another laid the foundation for the later training of optics scientists in western Europe.
- Al Bairuni (973-1014), the father of geodesy, was a great scientist, mathematician, astronomer, and historian who gathered information

in every branch of human knowledge, making the eleventh century the "Age of Bairuni." For example, he developed a theory of the universe, worked on cosmogony and the calendar, and traveled to India and collected masses of data on the subcontinent. He emphasized the importance of *akhbar wa rawayat* or information, news, and traditions in understanding the international relations of the time and the propagation of knowledge "to speak truth."

- Ibn Khaldun (1332-1406), a Muslim thinker and historian, has been called the father of sociology and demography. His economic analysis of social organization produced the first scientific and theoretical work on population, development, and group dynamics. His monumental work called *Mugaddimah (The Introduction)* laid the ground for his observation of the role of state, communication, and propaganda in history.

In general, six major factors contributed to the growth and expansion of information and communication during the early period of Islam. First, the very broad geographic presence of Islam with a high level of cross-cultural communications. Second, the tremendous integration and unity of information and technology. Third, the incredible advancement in useful data and knowledge. Fourth, an intercontinental economic system with sophisticated currency and transportation, culminating in high levels of trade. Fifth, a linguistic renaissance which allowed Arabic to become the international language of the time. And finally, an ethical framework in which information and communication thrived. Information in Arab history was not neutral, but a social and cultural commodity. Its conversion into knowledge, its pursuance and understanding in religious, social, and natural sciences necessitated the study of linguistic, grammatical, and even speculative fields.

Until the advent of Islam, the Arab world, restricted within the Arabian peninsula and some outlying tracts to the northwest and northeast, had shown no great signs of intellectual, scientific, economic, and political development. But the teaching of Islam had a revolutionary impact on the Arab mind. Within two decades, Medina, the seat of the commonwealth and the first state of Islam, became the center of gravity in international relations for hosts of Arabs as well as Persians, Syrians, Greeks, Egyptians and diverse nationalities from the north and west seeking new knowledge.

Communication has been an instrumental and integral part of Islam since its inception as a religio-political movement. Basic rights of communication in Islam included the right to know, the right to read (*igra*), the right to write (*ghalam*), the right to speak (*khutbah*), the right to knowledge (*ilm*), the right to consult (*shoura*), the right to disseminate

(*tabligh*), and the right to travel (*hijrah*). The Prophet of Islam in preaching the value of knowledge reportedly said that the ink of the scholar is more holy than the blood of a martyr; he repeatedly impressed on his disciples the necessity of knowledge and communication "even unto China."

Arab victories over the Persian and Roman empires extended Arab influence as far as central Asia and northern Africa, resulting in high levels of international and intercultural communication. Unprecedented amounts of information were shared in books and manuscripts. Great libraries and universities (*madrassas* and *nezamieyah*) were created, stretching from Samarkand to Baghdad and Cordoba, which served as centers of innovation and dissemination. There was a flow of information into the world of Islam and the Arab world from outside through international traders and merchants who had keen interest in geographical and economic information. The Arab world under Islamic unity represented the first attempt in history to bring oral and written cultures into a unified framework, laying the ground for the scientific revolution that followed in Europe many centuries later.

Communication has been an instrumental and integral part of Islam since its inception as a religio-political movement.

Information and communication technologies flourished in the Arab world between 630 and 1200 AD. Included were the *warragin* or intellectual scribes, paper and bookmaking industries, innovations in postal communication, navigation and transportation, and finally the development of world systems of commerce. The spread of the art of papermaking illustrates the early adoption of technology by the Arabs and their role in its diffusion to other civilizations. After its origin in central China in 105 AD and its use in Kashmir in the sixth century, papermaking was introduced into the Islamic world at Samarkand, traveled to Baghdad in 793 and Egypt in the year 900 or perhaps earlier; next start-ups were at Fez in Morocco and Jativa (or Xativa) in Spain, followed by Fabriano in Italy about 1270, Nuremberg in Germany in 1390, and England not until 1494. It was manufactured for the first time on the American continent in Philadelphia in 1690.

However, beginning with the 14th century, as conditions in the Arab world deteriorated, the centers of science, information, and communication shifted to the European world. Printing presses were introduced in Arab countries in the 16th century, some 200 years after their appearance in Germany. The first newspaper in Egypt, *Courier de l'Egypte*, was established by Napoleon in 1798 after he invaded the country. The development of Arab magazines began in 1884, when two reformers exiled in Paris, Jamal-aldin Al-Afghani

from Iran and Muhammad Abduh from Egypt, published the monthly *Al-Uruat al-Wuthqa* (The Firm).

Today, information and technology flows are much faster and more widespread, and technology is cheaper and more sophisticated, but new questions are arising about use, value, diffusion, ownership, control, norms, ethics, and exploitation of information. Currently, the drive toward market economies combined with the process of deregulation in many Arab countries has opened the way for new international flows of information and products into the Arab world. These include both cultural flows in the form of satellite television transmissions and entertainment programs transmitted from Europe, America, and elsewhere, and an expanding volume of manufactured and consumer commodities such as fast foods and breakfast cereals.

Against this background, it can be seen why it is important for communication policymakers and planners in the Arab world not to lose sight of the value of indigenous communication in this electronic age. Too often, there is a tendency, if not a desire, on the part of policymakers and planners to use modern communication technologies to displace native cultural modes of communication. For example, many planners think that by giving each peasant and villager access to a radio or television set, they will be able to modernize them, or by providing every young person with a personal computer and access to the Internet, they will succeed in educating them. This is a mistake. It is not the form of communication that matters the most, but the content as well as its social and cultural context. Although modern communication technologies hold the promise of equality and support for indigenous communication, much remains to be done before that promise is utilized. The main issue in the Arab countries is not the transfer of information from the developed countries, but the generation of appropriate information in the Arab world itself. It is here that policymakers and planners must differentiate between the mere transfer of information and the actual process of communication.

The main issue in the Arab countries is not the transfer of information from the developed countries, but the generation of appropriate information in the Arab world itself.

CURRENT INFORMATION ACTIVITIES AND TRENDS

The most recent ranking of the Information Society Index in January 2001 covers 150 countries' abilities to participate in the information revolution. The ISI indicates that 55 countries account for 98 per cent of the worldwide navigation of the "information superhighway." UAE, Saudi Arabia, Jordan and Egypt scored

respectively number 28, 44, 50, and 51 among these 55 nations, with Sweden, Norway, Finland, United States, and Denmark topping the list.

Last year, some $2.1 billion in information technology (IT) hardware, software and support services was sold in the Arab Middle East and North Africa. About 59 per cent of that demand came from Egypt, Saudi Arabia, and UAE, which together account for half of the estimated $600 billion GDP in the Arab world and where the demand for application service providers (ASP) is expected to mushroom.

In those three countries plus Jordan, telecommunication and Internet developments are proceeding apace, in a number of cases involving agreements with specialized firms and advanced industrialized countries:

UAE: Currently there are 2,120 web sites in UAE, mostly in the categories of business services, computers/information technology, universities and colleges, hotels and apartments, government, and associations (TradeArabia.com, May 13, 2001). Grandiose projects underway include Dubai Internet City and Dubai Media Center, intended to attract businesses and attention from around the world and make Dubai the regional hub for multinational corporations and tourists. Recently, Dubai Internet City welcomed the first company to its virtual village; Interactive Ltd. provides internet services such as an e-commerce application for customers to compare and purchase insurance products online (TradeArabia.com: May 16, 2001).

However, these developments are not without fault. Critics, such as Khaldoon Tabaza, co-founder and director of Arabia.com, a Jordan-based Internet company said, "We lack entrepreneurs with operational experience...we lack mentors. I wish part of the huge budgets spent on infrastructure could be used to build something like the Media Lab at Massachusetts Institute of Technology where people can focus on making the next breakthrough." (New York Times, June 10, 2001).

Saudi Arabia: Saudi Telecom Company, the country's sole provider of Internet and cellular phone services, may be privatized under a proposal recently passed by the Shura Council and sent for the King's approval. The plan would allow foreign companies to enter the telecom sector.

Jordan: At Maktoob, the Arabic/English e-mail service based in Amman, the flow of e-mails was increasing so rapidly that it made an agreement with the London office of Mirapoint, a California-based company, to handle it.

Egypt: The first private telecom franchise in Egypt was acquired by the National Telecommunications Corporation (NTC) in 1997, which entered a partnership with France Telecom to establish a payphone system. Demand for phones continues to grow: Egypt now has 6 million subscriber lines, with some 3 million people on the waiting list (Middle East Economic Digest, April 21,

2001). American Educational Telecommunications (AET), based in the U.S., has acquired the first international data transmission license granted to a private American company by Egypt. Finally, after President Mubarak announced an IT initiative, one response was a five-day IT trade mission in Cairo this year by the International Executive Service Corps, a nonprofit organization, with funding by the U.S. Agency for International Development (USAID).

At the Arab States regional level, a cooperative association was created in 1996 called the Regional Arab Information Technology Network (RAITNET) with support by the International Telecommunications Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

IMPACT OF NEW INFORMATION TECHNOLOGIES IN THE ARAB WORLD

A review of current findings on information and communication technologies in the Arab world highlights three trends. First, the distribution of technologies and access is growing among the citizenry at large, and not only the upper echelon of society. Second, there is grudging acquiescence by governments to greater scrutiny of their public policies by pan-Arab news sources via the Internet, satellite television and even printed newspapers available online. The third trend is the propensity of Arab nations to consume high-end technologies at equal or faster rates than many developed countries. These trends are discussed below.

The advent of pan-Arab radio, press and satellite TV has reduced the ability of governments to control the flow of information, both to nationals in Arab countries and to expatriate Arabs residing abroad. This conclusion was reached in a 1998 symposium on globalization, media, culture and security, held at Asilah, Morocco.

Another change which is activating Arab journalists is the disappearance of their long held belief that western journalists are impartial and objective. During the Gulf War, some Arab journalists "saw the western media playing the role of the lap-dog instead of the watch-dog," praising western technology and slighting Iraqi civilian casualties (Mowlana and others, 1992).

Modern communication technologies have broken some domestic social barriers and boundaries and opened up national and international public dialogue between decision makers and the citizenry. Among the Arab satellite channels, none invoke more political headaches and social discussion than the popular Qatari-based Al-Jazeerah channel. This is a 24-hour news source for Arabs from the coast of Morocco to the Tigris-Euphrates river valley of Iraq. It was launched in 1997 to the joy of the Arab citizenry and the dismay of the political body. Orthodox Muslim leaders debate liberal *Sheikhs* on the interpretation of the Qur'an. Political dissidents confront their accusers, feminists hold forth in debate,

and callers question guests on the show. Al-Jazeerah is helping to open the news door to Arabs who long relied on non-Arab sources for an opinion differing from the state-run media agencies.

The relationship between information and communication technologies and socioeconomic development is demonstrated in a number of recent surveys. Since 1996, for example, 63 variables have been measured in the economic, social and information environments of 40 emerging economies by the World Times Wealth of Nations Triangle Index. Using all variables, the Index's composite rankings for 1996-2000 placed Jordan, Tunisia, Morocco and Egypt at numbers 23, 24, 30 and 31 out of 40 countries (Taiwan, South Korea, Israel, and the Czech Republic topped the list). The Arab world also ranks low in adult literacy and is falling behind the major countries of sub-Saharan Africa, according to a Unesco survey (*New York Times*, September 10, 1999). It showed that 43 percent of Arabs are illiterate, most of them women, while Uganda, Zambia, and Zimbabwe have literacy rates ranging up to 90 percent.

It is not surprising that high-end technologies and sophisticated telecommunications infrastructure are prevalent in the more affluent Arab nations, primarily the six members of the Gulf Cooperation Council (GCC)—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. Bound by geographic proximity, with economies driven by vast petroleum and gas reserves, these countries are even taking steps to integrate their economies. The most recent evidence is an agreement to link their electric power grids. However, the GCC countries are not indicative of the remaining Arab nations.

New information and communication media have the ability to reinforce cultural and national identities as much as to generate cosmopolitanism and to expand internationalism among its audiences. The abundance of ethnic Arabs throughout the world, especially in Europe and the U.S., has allowed for a host of dialogue to occur across the globe on issues ranging from the Gulf war of the 1990s to the exhibitions of the British boxer Naseem Hamed, born of Yemeni parents. It was the Arabs in the technologically abundant West who pioneered Internet chat rooms and virtual news web sites for their compatriots abroad.

Recent statistics are available on the penetration of new information technologies in Arab countries—see tables 1 and 2. There are also a number of current research projects which provide initial data on the impact of those technologies on Arab societies. Among their findings:

- In Arab countries, "use of the Internet leads to more direct rather than representative democracy," "knowledge and information become more accessible, and governments no longer have a monopoly." These conclusions come from a report by Basyouni Hamada, Department of Mass

Table 1—TELEPHONE LINES, PCS, AND INTERNET USERS IN THE ARAB WORLD (1995–1997)

Country	Main telephone lines per 100 inhabitants 1995	Main telephone lines per 100 inhabitants 1997	No. of PCs per 1,000 inhabitants, 1995	No. of Internet users per 1,000 inhabitants, 1995
Algeria	4.21	4.75	3.0	0.0
Bahrain	25.69	24.57	50.3	1.7
Djibouti	1.33	1.33	NA	0.2
Egypt	4.70	5.57	NA	0.3
Iraq	3.30	3.28	NA	NA
Jordan	7.30	6.97	8.0	0.2
Kuwait	23.15	22.74	56.2	2.1
Lebanon	8.20	14.93	12.5	0.6
Libya	5.88	6.79	NA	NA
Mauritania	0.42	0.55	NA	NA
Morocco	4.30	5.00	1.7	0.1
Oman	7.90	8.35	12.7	NA
Palestine	NA	4.35	NA	NA
Qatar	22.30	24.94	NA	1.8
Saudi Arabia	9.58	11.72	NA	0.1
Somalia	0.17	0.15	NA	NA
Sudan	0.30	0.54	NA	NA
Syria	6.80	8.78	0.1	NA
Tunisia	5.82	7.02	6.7	0.1
UAE	29.10	35.09	48.4	1.1
Yemen	1.35	1.34	NA	NA

Sources: *Human Development Report; TTU 1995, World Telecommunication Development Report; TTU 1997. World Telecommunication Development Report; UNISCO 1997, Statistical Yearbook.*

Communications, UAE University. However, it is clear that access to the Internet is seriously undermined in many Arab countries by limited telecommunications infrastructure.

- Use of the Internet by 500 college students in Egypt, Saudi Arabia, UAE, Kuwait and Bahrain was studied by Sami Abdul Raoof Tayee (2000). He concluded that they look at the Internet as the fastest

Table 2—NUMBER OF ARAB INTERNET USERS IN 2000

Country	Date	Number	Pop %	Source
Algeria	July 2000	20,000	0.06	ITU
Bahrain	March 2000	37,500	5.17	DIT Group
Comoros	July 2000	800	0.14	ITU
Djibouti	July 2000	1000	NA	ITU
Egypt	March 2000	440,000	0.65	DIT Group
Jordan	March 2000	87,500	1.92	DIT Group
Kuwait	March 2000	100,000	5.02	DIT Group
Lebanon	March 2000	227,500	6.39	DIT Group
Libya	March 2000	7500	0.15	DIT Group
Mauritania	July 2000	2000	0.07	ITU
Morocco	May 1999	120,000	.4	SANGONET
Oman	March 2000	50,000	2.04	DIT Group
Palestine	October 1999	23,520	NA	Birzeit University
Qatar	March 2000	45,000	6.22	DIT Group
Saudi Arabia	March 2000	300,000	1.4	DIT Group
Somalia	July 2000	200	NA	ITU
Sudan	March 2000	10,000	0.03	DIT Group
Syria	March 2000	20,000	0.12	DIT Group
Tunisia	March 2000	110,000	1.16	DITnet
U.A.E	March 2000	400,000	17.06	DIT Group
Yemen	March 2000	12,000	0.07	DIT Group

Source: *http://www.nua/surveys/how_many_online/index.htv*

source of information, and that they therefore spend more and more time surfing the Internet and see other sources of information as less important. The study also cites criticism that the Internet is such an individual activity that it will adversely affect family relations and some cultural ways of life; other media such as television and radio can be used as a family, but not the Internet.

- The growth and spread of new information technologies, often seen as part of the globalization of culture, are contributing to the growth of national identity among Kuwaiti citizens, according to a study based on fieldwork in Kuwait by Deborah Wheeler, East-West Center, University of Hawaii.

RECOMMENDATIONS

In the light of this discussion, three recommendations are in order:

1. Development of information and communications infrastructure in the Arab world must be based on an integrated strategy and conceptual framework of the world view of Islam and the diverse religio-cultural landscape of the region. Such an infrastructure requires the development of a plan that takes into account local, community, and national needs based on participation, justice, freedom, and social responsibility.

2. Establishment of an Arab world information and communication institute that would generate its own information and knowledge base must be considered. It should help to establish an international Arab information network and train and educate communication scholars and practitioners, based on an authentic communication model suited for their societies.

3. Coordination of Arab scientists, information-communication specialists and technology experts is vital in working toward these objectives, together with international organizations. They should develop an appropriate information structure which insures the flow of information and knowledge to individual citizens as well as international and intercultural audiences.

As new and more advanced forms of communication expand their presence in the Arab world, there is also the question of the role these technologies can play in fostering development, which has come to occupy a prominent position in Arab societies. In particular, how can they promote development which is sustainable and equitable? How to avoid the problem that the "information superhighway" may overly accentuate the difference between those who can communicate and those who cannot?

Today, the Arab world can benefit greatly from the historical experience it went through during the early period of human communication, which culminated in the development of science and technology in the medieval Islam era and set the background for the renaissance in Europe. That experience included an unprecedented collaboration all across the territories of the Arab and Islamic world. Likewise now, it is clear that joint ventures and cooperation between and among the communications sectors of the Arab world is the most efficient and prosperous way to integrate diverse Arab societies. Such collaboration would be likely to continue the seminal role of communication in the future development of these societies, not simply as a service provider, but as an operator of regional, cultural, and social models in the age of globalization. The correlation between "political liberalization" and "economic liberalization" may be all too clear, as is the role of communication and information technologies in achieving them. But, in pursuing these objectives, we must acknowledge the fact that components of civil society in the Arab world have not

been fully considered in planning developmental projects. The aim of the information revolution is after all to enrich and unite humankind, and thus can only be achieved through cooperation and participation, and only then will societies in the Arab world reap the true benefits of the coming of "information society." ■

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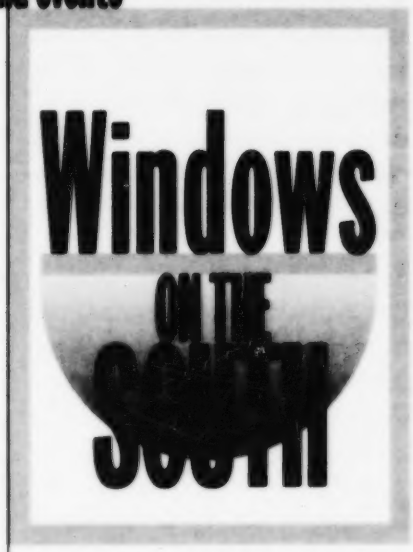

SATELLITES TRANSMIT DIRECTLY TO RECEIVERS ACROSS THE SOUTH

Created by an African, Noah A. Samara, WorldSpace has a far-reaching inter-regional mission:

> *"to create information affluence by using a new satellite-based infrastructure to deliver programming to the three-quarters of the world's population that lacks adequate radio reception and program choice and desires, deserves and demands high quality news, knowledge and entertainment at an affordable cost."*

Upon completion, the WorldSpace network will consist of three geostationary satellites (see top center photo on cover) reaching a potential audience of over 5 billion people:

- **AfriStar**, serving Africa and the Middle East, was launched in October 1998. In several months of field testing, the system exceeded expectations. In October 1999, transmissions began of more than 40 audio services of news, music, entertainment and educational programming to an area with an estimated one billion people. Multimedia services started in selected countries in 2000.
- **AsiaStar**, the second satellite, was launched in March 2000 to cover most of Asia, including China,

India, Indonesia, Malaysia, the Philippines, Singapore, Thailand and many southeast Asian islands. Before the year was out, it was transmitting more than 20 channels of audio and multimedia programming to a potential audience of nearly three billion people.

- **AmeriStar**, scheduled for launch in 2001, will provide service to Latin America and the Caribbean.

Programming

An example of WorldSpace's broadcast sources in the Southern world is "NGOMA, the African Dance Channel", which is available on AfriStar's south and west beams. Ngoma means "drum" or "rhythm" in the Swahili language, and the channel airs that type of music by African artists from across the continent.

Also, WorldSpace has agreements with BBC to broadcast programming via AfriStar and AsiaStar throughout Africa, the Middle East and southeast Asia , and with CNN International for news and entertainment service to Africa via the AfriStar satellite.

What WorldSpace provides is a platform from which international, regional and local programmers can reach vast audiences. It levels the playing field by providing the same signal strength and breadth of reach for all.

But audio broadcasts are only part of the story. Connect a receiver to a personal computer and it becomes a wireless modem capable of downloading gigabytes of text, data, software and images every day. WorldSpace is the only company providing this service.

Technologies

Until 1992, satellites operated by sending signals to large satellite dish stations on earth, for retransmission to individual receivers. In that year, the World Administrative Radiocommunication Conference allocated frequencies in the so-called "L" band (1467-1492 Mhz) for direct audio broadcast from satellites to individual receivers, bypassing the big dishes.

Noah A. Samara, born in 1956 to Ethiopian and Sudanese parents, founded WorldSpace in 1990 (see box) which developed new digital technologies for direct audio and data transmissions via satellite. By February 1999, the company had patents for signal formatting, subscription service with encryption, broadcast signal framing and transmission techniques, and handheld receivers using a tiny dish less than 4 inches in diameter.

The sending technologies were shaped in cooperation with several global industry leaders—including Alcatel Space, Fraunhofer Institut Integrierte Schaltungen, Micronas Intermetall, Matra Marconi Space, STMicroelectronics. The receivers were created with, and are being mass produced by, leading consumer electronics manufacturers—Hitachi, JVC, Matsushita (Panasonic) and Sanyo. The receivers are equipped with microintegrated circuits capable of processing both audio and data transmissions.

THE MAN BEHIND WORLDSPACE

Noah A. Samara was born in Ethiopia in 1956 to an Ethiopian mother and a Sudanese father who was a teacher and diplomat. He was raised in Ethiopia and Tanzania. In 1962 in Addis Ababa, his father hoisted him on his shoulders to see the leaders of the newly independent African states who came to sign the charters of the new Organization of African Unity—Nkrumah, Nasser, Kenyatta, Nyerere and Haile Selassie. He remembers it as "a great day" with a "palpable excitement that crackled through the air."

After receiving degrees in law and in international business from Georgetown University in Washington D.C., he became a communications attorney in the satellite industry. He was involved in development of both geostationary and low earth orbit (LEO) satellite systems, and advised numerous telecommunications and broadcasting organizations on a wide range of business and regulatory issues.

He began to investigate the information infrastructure and the broadcast and other media facilities in Africa, and to develop the vision that information was the key to expanding opportunities. "I found my Rosetta Stone," he says, when he realized that it was the "lack of infrastructure available to alert people" in Africa which led to widespread harrowing deaths from the AIDS virus. He founded WorldSpace with the mission of creating "information affluence by using a new satellite-based infrastructure to deliver programming to the three-quarters of the world's population that lacks adequate radio reception and program choice and that wants high quality news, knowledge and entertainment at an affordable cost."

"People are as developed as the information they can access," Mr. Samara says. "Radio reaches out to people where other media simply can't. It goes deep into people's minds, appealing to their imagination, rather than overwhelming their senses. Radio gives people the space to create. When we listen to words, sounds and music via WorldSpace, we become active participants in the creative process; we remain active without being tied down."

As chairman and CEO of WorldSpace, Mr. Samara has been profiled in recent years by major international media, and Africa International magazine awarded him its 1997 Innovation Trophy for his development of the WorldSpace system.

WorldSpace's hardware in the sky consists of powerful L-band satellites with traveling wave tube amplifiers and onboard baseband processors. The satellites are geostationary, orbiting over the globe in fixed positions more than 35,000 kilometers above the equator. Using powerful spot beams, each of which can support more than 50 services per beam, the satellites transmit to three overlapping coverage areas approximately 14 million square kilometers each.

On the ground, each satellite is supported by three major components which ensure good quality, uninterrupted signals: Regional Operations Center (ROC); Telemetry, Command and Ranging (TCR) Stations; and Communications System Monitoring (CSM) Stations.

This article draws on information on the Website www.worldspace.com. ■

VOTERS USE COMPUTERS IN BRAZILIAN ELECTIONS

The first model of an Electronic Voting Machine was developed in Brazil for its 1996 general elections, which used more than 80,000 of them. It was designed and prototyped by Brazilian engineers as part of a project of cooperation between Brazil's Higher Electoral Tribunal and UNDP. Then and in 1998 it was used only in counties with over 200,000 inhabitants. In 2000 it was used in elections at all levels—county, state and federal—by about 110 million voters in almost all of the 5,600 counties.

It works basically like a microcomputer with black-and-white crystal liquid monitor and a numeric keypad for entering votes (see top left photo on front cover). The monitor displays photos of candidates, which makes it easy to use, even by the nonliterate. In case of a power supply shortage, the machine keeps working by switching to battery operation. It includes a very high level of security as a guarantee against electoral abuses and violations both during and after the election.

At the end of election day, a summary report is printed for the local voting committee, and an encoded diskette is produced for consolidation via an integrated national network. Comprehensive national results were known the same day for a large majority of posts and towns.

For more information, go to the Website www.tse.gov.br. ■

SIMPUTER: A SIMPLE COMPUTER FOR MASS USE ACROSS INDIA

A group of Indian scientists and engineers has developed a handheld computer to help the poor and nonliterate join the information age. This simple computer, or Simputer, uses software that reads webpages aloud in native Indian languages, making it accessible to the 35

per cent of Indians who cannot read. The team has developed its own version of the web's formatting language to turn text into understandable Hindi, Kannada and Tamil speech, as well as English. The Simputer can also be an affordable communication device for many others in India, which is estimated to have only 2 million computers in a population of over 1 billion.

Trials of the Simputer were to begin in August 2001, and it is expected to be in wide use by early 2002.

The small, powerful Simputer is slightly larger than a Palm handheld computer, but has ten times the processing speed and more memory (see top right photo on cover). Using Information Markup Language (IML) to work out what text on a webpage should be read out, the Simputer turns it into artificial but understandable speech using a library of sounds stored on the machine. A touch screen, a graphical interface and a speech synthesis program that reads text aloud could allow nonliterate people to use the computer with ease.

IML is based on another web formatting language that preserves the structure of data. Typically, this is used to ensure numbers in spreadsheets or sales orders stay in the same place as they are moved around. The Simputer Team, however, has adapted it to preserve syntactical information and aid translation.

The Indian Government has started off many Internet-based projects that aim to give poor farmers access to land records and help them find new markets for produce. The Simputer team hopes its gadget will help the rural poor make better use of these initatives.

The Simputers are relatively cheap, around $200, and designed to be shared by multiple users. Everyone who wants access gets a smartcard that stores information about their preferences, and customizes the software on the machine for them. It can send and receive e-mail, browse the Web, and play MP3 files. The low cost is possible, in part, because the inventors relied on a nonproprietary operating system and other free software. Unlike a PC, which might cost four times as much, the computer stores data on the inexpensive smartcard instead of a hard drive.

The idea for the cheap and easy-to-use computer got off the ground in early 1999, when four colleagues at the Indian Institute of Science in Bangalore teamed up with the CEO and two vice presidents from a local software firm to form the nonprofit Simputer Trust. A year and a half later, the Simputer made its debut.

In May 2001, the four trustees from the Indian Institute of Science founded for-profit PicoPeta Simputers to commercialize the new machine. They are Vijay Chandru, V. Vinay, Ramesh Hariharan and Swami Manohar. PicoPeta is seeking half a million dollars in angel funding to build and field-test a few hundred prototype Simputers. If these prototypes drum up enough business, PicoPeta will seek $5 million in venture capital

to manufacture the machines; the company's aim is to have a marketable product ready by the end of 2001.

There are also plans to license the technology to any company that wishes to commercialize the Simputer. Firms in developing nations will pay a one-time fee of $25,000 to the trust, and those in industrial nations will pay ten times that. With one billion people living in India, the team has few worries about other manufacturers and sees no shortage of customers to keep PicoPeta profitable. The team also hopes the Indian Government will sponsor further development and drive its use forward.

The Simputer might find its first application in India's ubiquitous telephone kiosks, since the average middle-class family won't be able to afford to buy it. Users could swipe their smart cards through the machine to retrieve personal information, do banking and send e-mail.

Farmers could access market prices online to gain greater negotiating power with middlemen. Health-care workers in remote areas could look up medical information. Already organizations in India and abroad have expressed interest in using the devices for applications ranging from transportation management to rural banking. The hope is that, after the first months of 2002, the small gray box will become familiar to more and more people in India.

The Simputer project is being mirrored in other regions such as Japan, where the Morphy One is being developed, and in Brazil, where a VolksComputer is being designed.

This article draws on a BBC News transmission on 18 July 2001 by Mark Ward, and an article in MIT Technology Review *magazine for September 2001 by Alexandra Stikeman. For more information, go to www.simputer.org on the Web.* ■

SUPERCOMPUTERS AND HYPERBALLS: MASSIVE CALCULATIONS IN CYBERSPACE

Philip Emeagwali, a computer scientist from Nigeria, developed a formula which was used in 1989 to link 65,000 separate computer processors and perform 3.1 billion calculations per second. That feat led computer scientists to comprehend the capabilities of supercomputers and the practical applications of creating a system that allowed multiple computers to communicate and calculate together. The cover of this issue of *Cooperation South* (center middle image) displays Mr. Emeagwali's illustration of how to design a hyperball computer for weather forecasting—an example of bringing together billions of processing nodes in cyberspace.

Carrying out his vision is a radical new computer he programmed to solve important problems. Called the Con-

nection Machine, it can work faster and do more work than any computer on earth. He got the idea by watching clusters of bees build their honeycombs with amazing efficiency. So, he thought, why not program a computer that uses thousands of other computers (like bees) to work? Instead of a single huge computer the size of a luxury car to do all his work, Philip used the Internet to connect to 65,000 smaller computers. This way, he found, his computer could do an amazing 3.1 billion calculations a second and set a new world record.

Having established the fastest computer on Earth, Mr. Emeagwali started using it to figure out how oil flows underground so companies could extract the most oil in the cheapest and easiest way. Typically, oil is trapped within rocks—like water in a drenched sponge—and oil companies can remove only 5 to 50 per cent. Using his computer, he achieved a breakthrough and found a way to get much more oil out of the ground by solving an oil-reservoir-modeling problem.

Now his supercomputer is being used for several major international projects, such as improving the accuracy of weather predictions, explaining the unsolved mysteries of science, tracking the flow of blood in the human heart, calculating the movement of buried nuclear waste, tracking the spread of AIDS, and determining the long-term effects of gases in the air and how the heat of the sun is burning up the Earth in studies of global warming. Because he made possible the connection of many far-flung computers, he is recognized as one of the fathers of the Internet.

Among dozens of awards received for his pioneering work, in 1989 he was given the Gordon Bell Prize of the Institute of Electrical and Electronics Engineers, regarded as the computer world's Nobel Prize.

This article draws on information on the Website www.emeagwali.com. ■

LOW-TECH DEMOCRACY

It doesn't take the Internet and millions of computer hookups to achieve an information revolution. In four west African countries—Benin, Ghana, Mali and Senegal—private FM stations carrying talk-radio programs have been established. Both the transmitters used by the stations and the mass-produced battery-operated transistor radios used by the audiences are not expensive and not high-tech.

In Ghana, for example, 40 stations have cropped up since 1995, broadcasting in native Ghanaian languages and English. They play local music, read their own news, and offer hours and hours of live talk radio "where Ghanaians can tell the government and each other whatever's on their minds," according to Thomas L. Friedman reporting from Accra in the *New York Times*.

"For Ghana's poor, illiterate masses,"

writes Friedman, "being able to call the radio, or be interviewed in the market by a radio reporter with a tape recorder, has given them a chance to participate in politics as never before." Friedman quotes Yawowusu Addo, director of the state-run radio GBC, on the importance of open radio for democracy: "These FM radios helped us liberate ourselves. The public found their voice. The politicians could all hear ordinary people talking about the problems—corruption, unemployment." A government minister also saw the effects: "The minute people were able to talk freely—and anonymously—on the radio, and ask what officials were up to, was the beginning of accountability for government in Ghana" (Nana Akufo-Addo, Minister of Justice).

FM radio had a critical role in national elections. Ghanaians going to the polls called their local FM station if they saw any shenanigans, and it was broadcast in seconds. The radios were monitored by the election board, and it quickly responded.

So did the president of the Ghana Bar Association, Joseph Ebo Quarshie. He learned that soldiers were destroying voting boxes at one polling station, so he went on the local radio and read the article in the Constitution saying citizens have the right to resist interference in polling stations. The station played this over and over, Quarshie said, and "a couple of hours later the soldiers were chased off by voters."

Information drawn from "Foreign Affairs" column by Thomas L. Friedman, New York Times, May 1, 2001. ■

SHARING IDEAS

COOPERATION SOUTH is devoted to critical analysis and discussion of development issues of importance to the South. To this end, it welcomes the exchange of ideas and experience from all sectors, disciplines and viewpoints, and from sources ranging from policymakers and scholars, to practitioners and community activists.

Readers wishing to take an active part in this dialogue are invited to comment on articles published in the journal and to contribute articles for possible publication. Letters and manuscripts, which are subject to editing, should be sent to the Editor-in-Chief, Cooperation South, as follows:

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Another Way of Thinking

SAFIATOU BA-N'DAW

When the conventional wisdom is that prosperity can be generated only through market mechanisms and the free reign of cutthroat competition, let us work on South-South initiatives that advance the cause of public goods like R&D institutions, training institutions, universities, IT infrastructures, regional and subregional secretariats and other joint ventures that will help speed up the process of freeing millions of our people from the bondage of absolute poverty.

When the dominant position is intent on securing the advantages of those who are strong and well off, let South-South cooperation be a means by which mid-income countries reach out to render a helping hand to Least Developed Countries, and other countries in difficult development circumstances, through exchanges for sharing expertise, especially in such crucial areas as development planning, management, and policy formulation.

When time-honored traditions threaten to stand in the way of improving the human condition, let South-South cooperation provide fraternal means of learning from those societies that have empowered women, enhanced democracy and people's participation, respected cultural and religious practices, and maintained a healthy balance between stability and progress.

Where war, political conflict and economic depravity tear our societies apart, let us envision South-South initiatives to turn our warring and disgruntled youth into battalions of engineers, doctors, farmers, shopkeepers, industrialists, lawyers, teachers, business executives, diplomats and enlightened stateswomen and men.

When information flows follow well-established communications superhighways of developed countries, let us together place rich development-related content into WIDE, the internet-based information system for TCDC, and go on to envision incentives that will attract our talented people to stay in their home countries or telecommute from wherever they live to build knowledge societies in the South.

When the prevailing ethos calls for the assertion of national interest narrowly conceived, let us work together to advance the cause of intergovernmental and multilateral action and to address regional and global forces which also and increasingly have impact on the lives of people within our borders.

When donor fatigue seems to be the order of the day, let us together envision ways of mobilizing resources from within the countries of the South, drawing from our vast endowments of mineral wealth, forests, lakes, rivers, fertile soils, and plentiful sunshine, the ultimate energy resource.

Excerpt from the statement made by Madame Safiatou Ba-N'Daw, Director of the Special Unit for Technical Cooperation among Developing Countries, at the meeting of TCDC Focal Points in Teheran, Iran, on August 21, 2001.

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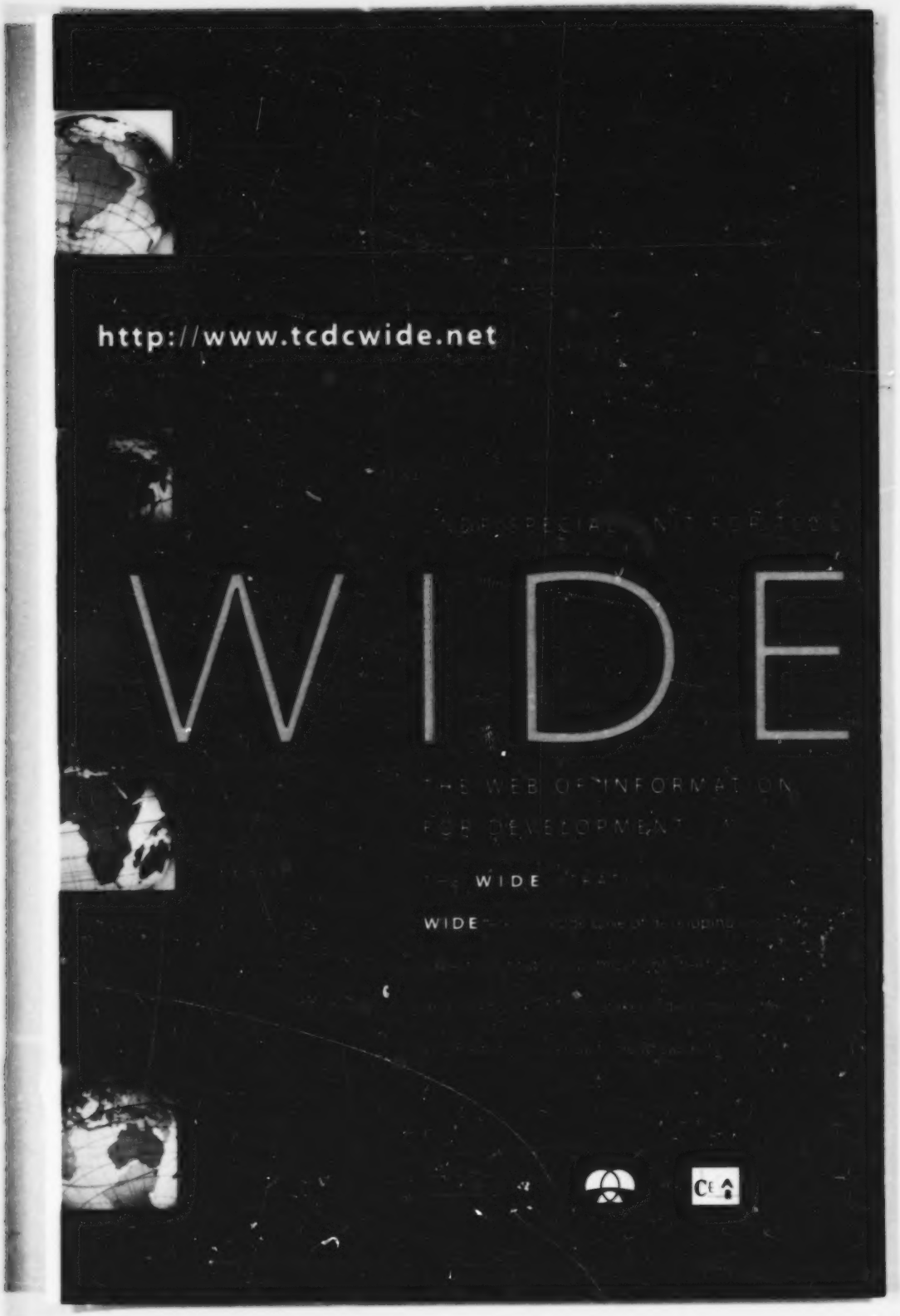
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WIDE
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GETTING CONNECTED:

Information and Communications Technology for Development

STRATEGIES

- **DIGITALLY EMPOWERED DEVELOPMENT.** Communities could use shared communications technologies to open up new ideas and opportunities, says Allen Hammond.
- **GLOBAL E-COMMERCE POLICIES SEEN FROM THE SOUTH** take on a different perspective from that in developed countries, according to Somkiat Tangkitvanich.
- **BUILDING FOUNDATIONS FOR E-COMMERCE IN HONG KONG** requires more strategic information technology use by firms and government, say Judith Hellows and Chun Kit Lok.
- **MAKING THE SOFTWARE INDUSTRY "OPEN."** Low-cost ways to benefit from information technology using "open source" systems are surveyed by Edward White.
- **ELECTRONIC DEMOCRACY: BUENOS AIRES AND MONTEVIDEO.** Uses of technology for internal management and citizen communication are compared by Susana Finquelievich.
- **EDUCATING CITIZENS OF THE GLOBAL LEARNING SOCIETY.** Michel Menou asks whether computer networking and electronic consumerism are serving societal goals or swamping them.
- **REACHING THE LAST MILE.** A shortcut method for bridging the "digital divide" between rich and poor countries is offered by three authors.

REGIONAL SURVEY

- **AFRIBOXES, TELECENTERS AND CYBERCAFES: ICT IN AFRICA.** Shared use of such communication resources as newspapers, Internet accounts and village TV sets are some strategies tailored to African conditions, says Mike Jensen.
- **PATHS BEYOND CONNECTIVITY: EXPERIENCE FROM LATIN AMERICA AND THE CARIBBEAN** shows changes needed if the Internet is to contribute to social development, as seen by three authors.
- **CREATING A KNOWLEDGE-BASED LABOR FORCE IN ASIA** means tailoring education to the new economic and technological environment, say Meheroo Jussawalla and Rana Hasan.
- **FROM MEDIEVAL TIMES TO MODERN: INFORMATION IN THE ARAB WORLD.** How communication technologies open up political, social and even religious debate to wider circles is explored by Hamid Mowlana.

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